



**David G. Hawkins**  
**Director, Climate Center**  
**Natural Resources Defense Council**

**Testimony**  
**Before the Subcommittee on Energy and Water Development**  
**Committee on Appropriations**  
**United States House of Representatives**

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**U.S. 10-Year Energy Research and Development Outlook**  
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Testimony of David G. Hawkins  
Director, NRDC Climate Center

Thank you for the opportunity to testify today on the subject of coal and the 10-year energy research and development outlook. My name is David Hawkins. I am 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.

I have been asked to focus my remarks today on coal as an energy source. How we use coal in the decades ahead will have a profound impact, for better or for worse, on our economy and our energy and environmental security. Coal is cheap and abundant compared to oil and natural gas. But 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.

Congress funds many activities related to America's use of coal, including appropriations for coal mine safety, mining reclamation programs, and EPA programs governing water and air pollution from coal mining and use to name but a few. Many of these programs are underfunded, with the result that damages from coal that should be corrected, go unabated. While these other appropriation accounts are beyond this committee's jurisdiction, I did not want them to go unmentioned.

In your role as appropriators it is critical that you ask hard questions to assure that monies spent on coal research, development and deployment (RD&D) are focused on the key challenges that we face from our use of coal. That task of course means how much money to spend and where to spend it. But I will argue that to assure taxpayers get value from your decisions on spending their money, it is even more important that we have in place a policy framework that will produce more results from every dollar appropriated.

This is especially true for the central challenge facing coal as an energy resource—that of its global warming emissions. Because coal is abundant, it is cheap and that makes it attractive to use in large quantities if we 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 per cent 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, federal policy must focus on deploying and improving systems that will keep the carbon in coal out of the atmosphere, specifically systems that capture carbon dioxide (CO<sub>2</sub>) from coal plants disposal in geologic formations.

RD&D funding is an important policy tool but it is only one tool. RD&D funding for coal in the absence of federal limits on carbon dioxide (CO<sub>2</sub>) emissions from coal and other fossil fuels is a

prescription for waste and procrastination. Now that federal funding for CO<sub>2</sub> capture and disposal (CCD) systems has reached the stage of large-scale demonstrations and deployment incentives, it is essential to link those funds with policies to reduce CO<sub>2</sub> emissions.

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, coal's abundance has been an economic boon, providing a cheap source of energy that fueled the industrialization of the U.S. and Europe in the past two centuries and is fueling Asia's industrialization in this century. 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. 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.

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, 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 CO<sub>2</sub>, 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 CO<sub>2</sub> 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 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 are forecast to capture their CO<sub>2</sub>.

Each new coal plant that is built carries with it a huge stream of CO<sub>2</sub> emissions that will likely flow for the life of the plant—60 years or more. Suggestions that such plants might be equipped with CO<sub>2</sub> 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 these plants are built with no CO<sub>2</sub> controls, their lifetime emissions will create an enormous pollution lien on our children and grandchildren. Over a projected 60-year life these plants would likely emit 750 billion tons of CO<sub>2</sub>, a total, from just 25 years of investment decisions, that is 30% greater than the total CO<sub>2</sub> emissions from all previous human use of coal. Once emitted, this CO<sub>2</sub> pollution load remains in the atmosphere for centuries. Half of the CO<sub>2</sub> emitted during World War I remains in the atmosphere today.

In short, we face an onrushing train of new coal plants that must be diverted without delay. What can the U.S. do to help? The U.S. is forecasted to build nearly 300 of these coal plants, according to reports and forecasts published by the U.S. EIA. By taking action ourselves, we can speed the deployment of CO<sub>2</sub> capture 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.

Federal RD&D funding can help 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 CO<sub>2</sub> emissions are adopted. This year in Congress serious attention is finally being directed to enactment of such measures. Such limits will allow you to assure taxpayers that the amounts you appropriate for coal RD&D will be used to speed real business interest in low-carbon private sector investments. You will create the best value for taxpayers by coordinating your RD&D appropriation decisions with the authorizing committees that are considering mandatory emission reduction programs.

In the Administration's budget request for FY2008, the Department of Energy calculates that if no greenhouse gas (GHG) limits are enacted, the economic benefits of the fossil RD&D spending it requests will be nearly eight times less than in the case where significant carbon limits are enacted: \$31 billion in cumulative savings in energy expenditures from 2008-2030 in the "business as usual" case, compared to \$238 billion in savings in the carbon limits case.<sup>1</sup> While one can quarrel with the absolute size of these estimates, it is clear that RD&D funding for low-carbon coal systems provides much larger value for the taxpayer when linked to policies that require reductions in carbon emissions. NRDC urges the committee to work closely with the authorizing committees to develop an integrated policy and appropriations package in this congress.

## Funding Priorities

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<sup>1</sup> Detailed Budget Justification FY2008 Energy and Water Development Appropriations, Volume 7 at 16, DOE, February 2007. The carbon limits assumed by DOE would reduce U.S. emissions by about 15% from current levels in 2020, by about 25% in 2030, and by about 40% from current levels in 2050. DOE Benefits Forecast Scenarios, DOE Office of Fossil Energy, February 2007.

While the Energy and Water Development account covers much more than coal research, I will limit my comments to the coal area. I would also note that NRDC believes that there is a continuing need to provide greatly increased funding for RD&D for the most sustainable and secure energy resources: energy efficiency and renewables areas.

NRDC believes the top priority for coal RD&D is to enable rapid deployment of CO<sub>2</sub> capture and geologic disposal (CCD) from coal-based power plants. As sketched above, the large numbers of new coal plants on the drawing boards both here and abroad will lock us in to billions of tons of increased CO<sub>2</sub> emissions unless CCD is rapidly established as the best practice for new coal investments. The RD&D activity that most directly contributes to this strategic objective is funding of a number of large-scale (greater than one million tons CO<sub>2</sub> annually) geologic injection projects in a range of formations. We recommend adequate funds to carry out approximately six multi-megaton CO<sub>2</sub> injection projects starting in FY2008

The administration's FY08 request for the sub-program that includes such projects is for \$72 million, an increase of only \$5 million from the FY07 request, and representing only 17 per cent of the Coal RD&D sub-program request. The administration states this amount will allow initiation of four projects with approximately 1 million tons of CO<sub>2</sub> injected. It does not appear that this amount of funding would be adequate to support the number and size of projects that NRDC recommends. A key factor in the cost to the government of such projects is whether the costs of capturing and delivering the CO<sub>2</sub> to project site will be paid for by the government. The costs of providing compressed CO<sub>2</sub> at the source plant gate can vary from less than \$5 per ton of CO<sub>2</sub> to as much as \$30 per ton depending on whether the plant is a high-concentration source (like ethanol plants, some gas processing plants, and some chemical plants) or a low-concentration source, like existing power plants.

To accelerate the initiation of these large-scale projects, DOE should consider starting them with high-concentration existing sources. But these projects should be located and designed so that they can become sites for disposal of CO<sub>2</sub> from any new coal power plants that are now in the planning phase. To complete the picture there will need to be a reason for such new coal plants to be equipped with CO<sub>2</sub> capture systems. Adopting well-designed emission limits policies such as a cap and trade program, CO<sub>2</sub> performance standards for new power plants, and a low-carbon generation obligation is more appropriate and effective than using taxpayer dollars to subsidize CO<sub>2</sub> capture from such plants. Expenses for capture of CO<sub>2</sub> from power generation should be assigned to power consumers rather than the general taxpayer. With approaches such as the tradable low-carbon generation obligation in S.309, this can be achieved with no significant impact on ratepayers because the capacity with capture equipment will be a very small fraction of generation for some time.

We ask the committee to question DOE carefully on what level of large-scale CO<sub>2</sub> sequestration project activity can be supported with the administration's request and how much of the total is projected for the expense of purchasing CO<sub>2</sub>. Answers to these questions will be essential to assist the committee in determining the required level of funding to support an adequate suite of large-scale projects and an appropriate assignment of the costs for delivering CO<sub>2</sub> to the project sites.

Beyond adequate funding of large-scale sequestration projects, we believe there are several other high priority activities. Work on advanced CO<sub>2</sub> separation concepts both in pre-combustion and post-combustion applications are worthy of continued funding but here too it is important to use government funding to leverage the much larger amounts of funding that a motivated private sector can provide. Huge business sectors and large firms have important business reasons to invest in these concepts; the role of government funding should be to stimulate additional private sector investments, not to substitute for these investments. And as I have discussed RD&D funding needs to be complemented with government policies to limit emissions. It is those policies that will create the market for low-emitting technologies and it is the prospect of those market opportunities that will drive private sector investments at the required scale, not the prospect of government grants.

Another area where successful efforts can produce large rewards is high-efficiency turbine development. More efficient turbines will benefit all forms of power generation. As above, private firms have a large stake in these improvements and government funding should be used to get multiple dollars of private sector investment for each taxpayer dollar.

The two largest components of the Coal RD&D request outside the Fuels and Power System sub-program are the Clean Coal Power Initiative (\$73 million) and the FutureGen project (\$108 million). The CCPI request is for a Round 3 solicitation for so-called “clean coal” projects. While the justification states that the program is “targeting” Round 3 to systems that “capture carbon dioxide for sequestration or beneficial reuse,” there is no other detail provided. We do not recommend funding the CCPI request without a much more specific and focused proposal.

We believe that any CCPI projects must be focused laser-like on actual CO<sub>2</sub> capture and geologic disposal projects, something that has been lacking in many previous CCPI projects. We do not support projects for “beneficial reuse” of CO<sub>2</sub> because if the CO<sub>2</sub> is not sequestered it will be released into the air. Projects like enhanced oil recovery (EOR) can and should be carried out to result in sequestration of the injected CO<sub>2</sub>. Given today’s price of oil, however, such projects would be a low priority for federal RD&D funding.

The administration request for the FutureGen project is large in absolute and relative terms: \$108 million, which is double the FY07 request. While the focus of FutureGen is in line with the priority need for projects that capture CO<sub>2</sub> for geologic disposal, given the competition for funding, it is important for the committee to seek additional details on the value added that FutureGen will provide compared to other uses of these funds to stimulate early deployment of commercial scale gasification with CO<sub>2</sub> capture, hydrogen production and geologic disposal.

The administration request also seeks to guarantee \$9 billion of loan obligations under the Title XVII loan guarantee provisions of the Energy Policy Act of 2005. DOE states it will seek to guarantee \$4 billion in loans for “central power generation facilities (for example, nuclear facilities or carbon sequestration optimized coal power plants);” \$4 billion for biofuels and “clean transportation fuels;” and \$1 billion for electric transmission facilities or renewable power generation systems.

We do not support this request as proposed. The Title XVII loan guarantee program has such inadequate eligibility criteria for qualifying projects that it amounts to a subsidy for private sector investments that may provide no public benefits. Under Title XVII, any technology that is a “significant improvement” compared to technologies in general commercial use is eligible for a loan guarantee if it also will “avoid, reduce, or sequester air pollutants or anthropogenic emissions of greenhouse gases.” Since there is no benchmark specified for the condition to “avoid” or “reduce,” essentially any energy project could qualify. As with the other elements of the coal accounts, we believe that any appropriation for loan guarantees available to coal projects should be restricted to projects that actually capture and geologically dispose of CO<sub>2</sub>. The DOE request clearly is not restricted in that fashion. A “carbon sequestration optimized” coal power plant is not defined and could mean almost anything, including 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.” Such projects do not warrant loan guarantee support.

The request also seeks to guarantee loans for “clean transportation fuels.” This too is not defined but might be interpreted to include fischer-tropsch fuels made from coal. We strongly oppose loan guarantees for these facilities. Using coal to make liquid transportation fuel is simply not compatible with the need to achieve significant reductions in CO<sub>2</sub> emissions from the transportation sector over the next few decades. Liquid coal produced by plants that vent their CO<sub>2</sub> would have full fuel cycle CO<sub>2</sub> emissions nearly double that of gasoline made from crude oil. Filling a hybrid’s tank with liquid coal fuels would result in as much global warming pollution as driving a Hummer on gasoline. Even if liquid coal production plants captured their CO<sub>2</sub> (something not required under the loan guarantee program), the full fuel cycle CO<sub>2</sub> pollution would still be about 10 per cent worse than gasoline from crude. We need to reduce our oil dependence but we need to do it smarter: vehicle efficiency and biofuels are cheaper and cleaner alternatives. If coal is to play a role in reducing oil dependence it should do so by producing electricity at power plants that capture and dispose of their CO<sub>2</sub>. That electricity can be used to run plug-in hybrid vehicles with much lower overall pollution than using the same coal to make liquid fuel.

To sum up Mr. Chairman, a critical strategic priority for coal today is the deployment of systems that will capture CO<sub>2</sub> for geologic disposal from coal plants. If we fail to take this and other steps to use energy resources that do not emit CO<sub>2</sub>, we will condemn our children to potentially ruinous disruptions of the climate that all societies depend on for economic development and social stability. This year’s budget provides an opportunity to focus coal RD&D appropriations on this critical challenge but RD&D is only a piece of the policy framework. To produce real advances, those RD&D funds must be integrated with programs to require reductions in CO<sub>2</sub> emissions. Those programs are the tool we need to drive the much larger private sector investments that must happen if we are to address the threat of global warming.

Mr. Chairman, that completes my testimony, I will be happy to take any questions you or other committee members may have.