

**ENERGY AND WATER, AND RELATED AGEN-  
CIES APPROPRIATIONS FOR FISCAL YEAR  
2007**

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**THURSDAY, MARCH 30, 2006**

U.S. SENATE,  
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,  
*Washington, DC.*

The subcommittee met at 10:13 a.m., in room SD-138, Dirksen Senate Office Building, Hon. Pete V. Domenici (chairman) presiding.

Present: Senators Domenici, Bond, Allard, Reid, and Murray.

**DEPARTMENT OF ENERGY**

**STATEMENT OF DAVID K. GARMAN, UNDER SECRETARY OF ENERGY  
FOR ENERGY, SCIENCE AND ENVIRONMENT**

**ACCOMPANIED BY:**

**JAMES RISPOLI, ASSISTANT SECRETARY OF ENERGY FOR ENVI-  
RONMENTAL MANAGEMENT**

**JEFFREY JARRETT, ASSISTANT SECRETARY FOR FOSSIL ENERGY**

**OPENING STATEMENT OF SENATOR PETE V. DOMENICI**

Senator DOMENICI. The hearing will please come to order. Now, this is a very lengthy hearing. We are going to try to do it all. I do not know if we can finish it in the time allotted. If we do not, we will hold it over to this afternoon and try to finish it for whomever can come. The witnesses that are not finished this morning, please understand, get on your telephones and advise people you might have to be here this afternoon.

I have a very lengthy statement. There is no other way for me to do it. But I am going to yield to the distinguished ranking minority leader for his opening remarks. Then I will have mine and then if either Senator would like. I would like them to keep them brief and to the point.

Senator Reid, thank you for coming.

**STATEMENT OF SENATOR HARRY REID**

Senator REID. Mr. Chairman, thank you very much. I appreciate your courtesy. I know everyone is busy and I feel that I should not step out of line, but I appreciate your allowing me to do so.

Secretary Garman, Dr. Orbach, I am delighted to see the proposed increases for the Office of Science Research Programs. As a supporter of balanced energy policy, I believe that your office has an absolutely critical role to play in delivering discoveries and sci-

entific tools that transform our understanding of energy and matter in areas as diverse and fundamental as biological and environmental research to nuclear power and even fusion.

I am also pleased to see the proposed increases for energy sciences, computing, nuclear physics, fusion energy, including the \$41 million increase for the International Thermonuclear Experimental Reactor project, known as ITER.

Dr. Garman, I am similarly pleased to see the increases for the proposed Advanced Energy Initiative. I laud the value of research and development to promote American energy security and a corresponding decrease in our dependence on foreign resources. I also believe that the proposed initiatives in biofuels, hydrogen, and solar research can all play a significant role in our future energy security.

I am, though, disappointed by your decision to zero out the geothermal energy program. I am really somewhat mystified. I see nothing in the budget request to defend this action of yours, so I assume you are hard-pressed to come up with an answer. Geothermal is really something that needs to be used. It is there, it is at our fingertips, and some have referred to Nevada as the Saudi Arabia of geothermal energy.

I have a series of questions and a separate statement for the record on this issue and I ask consent that I can submit these to you.

Senator DOMENICI. Without objection.

Senator REID. Though you should be assured I will continue to press for geothermal energy in next year's budget, this year's budget, fiscal year 2007.

I hope you will also take some time to discuss why you did not avail yourself of the fiscal flexibility offered in last year's conference report concerning Congressionally directed activities. I am very eager to understand what led you to the conclusion that laying off National Renewable Energy Lab employees, if only for a week, made sense, given the broad authority you had to avoid such an outcome. It embarrassed the President and it embarrassed all of us.

This subcommittee needs to be in a position to support the President's competitiveness and energy initiatives. However, unless this committee receives a higher budget allocation some very difficult choices will have to be made between proposed increases in nuclear and renewable energy programs, while programs such as fossil energy are severely shortchanged. For every huge plus-up of new ideas by the President, you have cut huge congressional priorities. Congress is going to have to restore your indefensible, I believe indefensible, cuts to the weatherization program, clean coal power initiative, and geothermal energy programs, just to name a couple.

The most likely sources of these funds in a flat budget environment are big initiatives that are seeing huge funding pushes and it is hard for us to comprehend that. For example, Yucca Mountain. The Department has requested \$544 million. This represents an increase over the \$495 million of last year of \$50 million. I am convinced that the proposed Yucca Mountain nuclear waste dump will never be built. We know it is mired in scientific, safety, and tech-

nical problems. When this bill was passed 20 years ago, there was reason for doing it. It has not worked well.

In 1987 Congress, as we know, took additional action. It was based on political expediency and it has not worked well. DOE has been studying this site for 20 years. The studies are incomplete and do not provide a basis for evaluating whether Yucca Mountain is a safe site for storing nuclear waste or that we can transport it across America's highways and railways to our communities, past our schools and hospitals and through major metropolitan areas. Transportation of nuclear wastes around the country and to Yucca poses hazards to public health, economic and national security, and environmental safety from accidents and terrorist acts, issues that did not exist in 1982, issues though which, with the changing environment, DOE has refused to address.

Moving about 80,000 tons of waste to Yucca would involve at least 55,000 truckloads, maybe as many as 10,000 rail shipments, through counties which include 250 million people—Sacramento, Buffalo, Denver, Chicago, the District of Columbia.

Before his election, President Bush wrote, I quote: "I believe sound science and politics must prevail in the designation of any high-level nuclear waste repository. As President, I would not sign legislation that would send nuclear waste to any proposed site unless it has been deemed scientifically safe." Again, President Bush let politics and unsound science prevail.

A few of the scientific problems that we have seen even in the last year-and-a-half include: a court decision throwing out EPA's radiation protection standards as they were not strong enough to protect the public from radiation exposure and failed to follow the recommendations of the National Academy of Sciences. Next, EPA published in 2005 its revised standards for the proposed site, which most scientists believe are inadequate, do not meet the law's requirements, and do not protect public health and safety. In fact, EPA is proposing the least protective health radiation standard in the whole world.

Numerous scientific and quality assurance problems with transportation have also been brought to our attention, problems dealing with transportation, corrosion of casks, effectiveness of materials, causing DOE to suspend work on the surface facilities and to issue a stop-work order on the containers.

Also, DOE revealed that documents and models about water infiltration at Yucca Mountain had been falsified. People lied about it. They whitewashed the problem, but they cannot whitewash the DOE Inspector General's report that DOE continues to ignore falsification of technical and scientific data on the project. This is not the governor of Nevada or some State legislature, but it is the Inspector General of the Department of Energy that says this, that the DOE continues to ignore falsification of technical and scientific data.

In numerous media reports, the administration has confirmed that it is preparing a legislative package that will remove health, safety and legal requirements, a clear admission, I suggest, that the project is a public health and safety and scientific failure.

It should be clear to anyone that the proposed Yucca Mountain project is not going to move. It will never open. Yet we must safely

store spent nuclear fuel. It is time to look at other alternatives. Fortunately, the technology to realize a viable, safe, and secure alternative is readily available and can be fully implemented within a decade. That technology is on-site dry cask storage. As we speak, dry casks are being safely used at 34 sites throughout our country. Even NEI projects 83 of the 100 active reactors will have dry cask storage by 2050.

Senator Ensign and I have a bill that would safely store nuclear waste while we look for a scientifically based solution, the Spent Fuel On-Site Storage and Security Act. Our bill requires commercial nuclear utilities to secure waste in licensed on-site dry cask storage facilities. There is no justification for endangering the public—I pushed it down with my card. Thanks, Mr. Chairman.

There is no justification for endangering the public by rushing headlong toward a repository that is fraught with scientific, technical, and geological problems when it can be stored safely and securely in dry casks. The bill guarantees all Americans that our Nation's nuclear waste will be stored in the safest way possible. So it is time we proceed to address the problem, the safe storage of spent nuclear fuel, and stop pouring hundreds of millions of dollars every year down the drain.

#### PREPARED STATEMENTS OF SENATOR HARRY REID

Since the Yucca project I believe is a failure, I will continue to oppose it. I want to, Mr. Chairman, spread on the record how, even though we have butted heads on this issue for many, many years, it has all been in the sense of policy differences. You have been a gentleman to work with and I appreciate that, extending today to allowing me to go first, and I apologize to my colleagues for taking as long as I have with the statement.

[The statements follow:]

#### PREPARED STATEMENT OF SENATOR HARRY REID

Mr. Chairman, I appreciate you holding this combined hearing today to discuss the fiscal year 2007 budget request for a large number of Department of Energy programs, including the Office of Science, the Energy Efficiency and Renewable Energy programs, the Office of Electricity, the Fossil Energy program, the nuclear energy program, the Office of Legacy Management, the Office of Environment, Safety and Health, the Environmental Management program and, of course, the Yucca Mountain program.

I am pleased to welcome Mr. Dave Garman, the Under Secretary for Energy, Science, and the Environment, and Dr. Raymond Orbach, the Director of the Office of Science.

I am going to submit several longer statements for the record regarding the Energy Supply Program and Office of Science generally, and the geothermal energy program specifically.

However, while I am here today, I would like to offer several brief observations about the overall budget request for these programs and then a much longer discussion about the on-going government failure and embarrassment that is the Yucca Mountain Program.

Mr. Chairman, I will try to be brief.

Dr. Orbach, I am delighted to see the proposed increases for the Office of Science research programs. As a supporter of a balanced energy policy, I believe that your office has an absolutely critical role to play in delivering discoveries and scientific tools that transform our understanding of energy and matter in areas as diverse and fundamental as biological and environmental research to nuclear power and fusion.

I am pleased to see the proposed increases for basic energy sciences, computing, nuclear physics, and fusion energy including the \$41 million increase for the International Thermonuclear Experimental Reactor project (ITER).

I was prepared to ask you some very specific questions about job impacts based on enactment of this budget request to make sure we avoid any problems similar to what we faced this year, but given the massive increases I think I can forgo that line of questioning.

Mr. Garman, I am similarly pleased to see the increases for the proposed Advanced Energy Initiative. As you are aware, I laud the value of research and development to promote American energy security and a corresponding decrease in our dependence on foreign resources. Further I believe that the proposed initiatives in Biofuels, Hydrogen, and Solar research can all play a significant role in our future energy security.

I am, however, mystified by your decision to zero out the geothermal energy program. I see little effort in the budget request to even bother to try to defend this action, so I assume you were hard-pressed to dream one up. I have a very long series of questions and a separate statement for the record on this issue. However, it is safe to say that there will be a geothermal energy program in fiscal year 2007.

I hope you will also take some time to discuss why you did not avail yourself of the fiscal flexibility offered you in the fiscal year 2006 Conference Report concerning Congressionally-directed activities. I am very eager to understand what led you to the conclusion that laying off National Renewable Energy Lab employees, if only for a week, made sense given the broad authority you had to avoid such an outcome.

Finally, this subcommittee wants to be in a position to support the President's Competitiveness and Energy Initiatives. However unless this committee receives a higher budget allocation, some very difficult choices will have to be made between proposed increases in Nuclear and Renewable Energy programs while program such as Fossil Energy are severely shortchanged.

For every huge plus-up of shiny new ideas by the President, you have cut huge Congressional priorities. Congress is going to have to restore your indefensible cuts to the Weatherization Program, the Clean Coal Power Initiative, and the geothermal energy program, just to name a few. The most likely sources of these funds, in a flat budget environment, are big initiatives that are seeing huge funding pushes.

As for Yucca Mountain . . . .

The Department has requested \$544 million for fiscal year 2007 for the nuclear waste repository program. This represents an increase over the current year appropriated amount of \$495 million by approximately \$50 million.

I am convinced that the proposed Yucca Mountain nuclear waste dump will never be built because the project is mired in scientific, safety and technical problems.

In 1982, Congress passed the Nuclear Waste Policy Act, which called for disposal of nuclear waste in a deep geological repository that would remain stable for thousands of years and directed DOE to pick the most suitable site based on the natural, geologic features of the site.

In 1987, Congress took action based on political expediency and limited DOE's studies to Yucca Mountain, despite the fact that the criteria in the Act would disqualify the Yucca Mountain site.

DOE has been studying the site for 20 years. The studies are incomplete and do not provide a basis for evaluating whether Yucca Mountain is a safe site for storing nuclear waste or that it can be transported safely across America's highways and railways and through our communities, past our schools and hospitals and through major metropolitan areas.

Transportation of nuclear waste around the country and to Yucca poses hazards to public health, economic and national security and environmental safety from accidents and terrorist attacks, issues which DOE has not addressed.

Moving 77,000 tons of waste to Yucca would involve about 53,000 truck shipments or 10,000 rail shipments over 24 years, through counties in which nearly 250 million people live, including Sacramento, Buffalo, Denver, Chicago, Washington DC, and Las Vegas.

Before his election, President Bush wrote, "I believe sound science, not politics, must prevail in the designation of any high-level nuclear waste repository. As President, I would not sign legislation what would send nuclear waste to any proposed site unless it's been deemed scientifically safe."

Now President Bush is letting politics and unsound science prevail at Yucca Mountain.

A few of the scientific problems that we have seen the last year and a half include:

- In 2004, the Court threw out EPA's first radiation protection standards for Yucca because they were not strong enough to protect the public from radiation exposure and failed to follow the recommendations of the National Academy of Sciences.
- In 2005, EPA published its revised standards for the proposed Yucca Mountain high-level waste dump, which are wholly inadequate, do not meet the law's requirements and do not protect public health and safety. In fact, EPA is proposing the least protective public health radiation standard in the world.
- Numerous scientific and quality assurance problems with transportation plans, corrosion of casks, the effectiveness of materials, etc., causing DOE suspend work on the surface facilities and NRC to issue a stop work order on the containers.
- In addition, DOE revealed that documents and models about water infiltration at Yucca Mountain had been falsified. They whitewashed this problem, but cannot whitewash the DOE Inspector General's report that DOE continues to ignore falsification of technical and scientific data on the project.

In numerous media reports, the administration has confirmed that it is preparing a legislative package that will remove health, safety and legal requirements, a clear admission that the project is a public health, safety and scientific failure.

It should be clear to anyone that the proposed Yucca Mountain project is not going anywhere. Yucca Mountain will never open.

Yet, we must safely store spent nuclear fuel.

It is time to look at other nuclear waste alternatives. Fortunately, the technology to realize a viable, safe and secure alternative is readily available and can be fully implemented within a decade if we act now. That technology is on-site dry cask storage.

Dry casks are being safely used at 34 sites throughout the country. NEI projects 83 of the 103 active reactors will have dry storage by 2050.

Senator Ensign and I have a bill that would safely store nuclear waste while we look for a scientifically-based, safe solution—The Spent Fuel On-Site Storage and Security Act of 2006, S. 2099. Our bill requires commercial nuclear utilities to secure waste in licensed, on-site dry cask storage facilities.

There is absolutely no justification for endangering the public by rushing headlong towards a repository that is fraught with scientific, technical and geological problems when it can be stored safely and securely in dry casks. Our bill guarantees all Americans that our Nation's nuclear waste will be stored in the safest way possible.

It is time we addressed to problem at hand—the safe storage of spent nuclear fuel—and stopped pouring taxpayers' money down the drain on a project that could endanger all of our citizens.

The Yucca Mountain project is a failure. I vow to continue to fight this project.

Thank you, Mr. Chairman. As always, I look forward to working on these issues with you and your staff.

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SUPPLEMENTAL STATEMENT OF SENATOR HARRY REID

REGARDING THE TERMINATION OF THE GEOTHERMAL ENERGY PROGRAM

We need to put America on the path to energy independence with policies that promote advanced energy technologies. Energy is critically important to America's future and our national security. That's why I joined as a leader in the Democrats' plan to make America energy independent by 2020.

Our plan builds on a fundamental commitment to support expanded renewable energy development. The development of renewable energy will bolster our national security, protect our environment, and create jobs in Nevada, while also providing a steady, reliable supply of energy for consumers.

Nevada has many features that make it an ideal location to develop renewable energy sources. In fact, our State has been a leader in this area for many years. Nevada is particularly rich in geothermal energy, which could meet one-third of our State's energy needs. I worked with then-Energy Secretary Bill Richardson to launch the Geopowering the West initiative in 2000 to help develop Nevada's tremendous geothermal potential. This project funds public/private partnerships to develop geothermal power in Nevada, California, New Mexico, and Utah, with the ultimate goal of providing 10 percent of the electricity needs of the Western States from geothermal sources by the year 2020.

One of the great advantages of renewable energy is that these technologies work in harmony with the environment and do not leave a legacy of dangerous waste

products that future generations will have to figure out how to deal with. One of the best legacies we can leave to our children is a clean environment and a history of preservation of our natural beauty and wilderness. We always will need clean water to drink and safe air to breathe. While we have made much progress over the last 30 years, it is critical that we maintain our strong commitment to safeguarding our Nation's natural heritage and protecting our environment.

Our Nation's leadership must put us on a path that protects the environment and builds a new, sustainable economy. Both the environment and the economy are crucial to our Nation. Without a strong economy, it is impossible to protect our environment adequately. Without a healthy environment, our economy cannot thrive. The best technologies to address both our energy and economic needs are energy efficiency and renewable energy, and I believe that most of my colleagues in the Senate would agree with that assertion.

For a moment, I thought I might hear the administration agreeing with us. The proposed fiscal year 2007 Budget of the Department of Energy began with fanfare that gave that impression. In its press release on February 6, DOE said: ". . . the Department of Energy (DOE) requests \$23.6 billion, a \$124 million increase over the fiscal year 2006 request. The fiscal year 2007 budget request makes bold investments to improve America's energy security while protecting our environment, puts policies in place that foster continued economic growth, spurs scientific innovation and discovery, and addresses the threat of nuclear proliferation."

But getting past the fanfare, the reality of the proposed fiscal year 2007 budget is far different. The administration's budget goes in the opposite direction, cutting efforts to develop clean, renewable energy and promoting technological choices that will make our nuclear proliferation a greater threat and expanding our nuclear waste legacy to future generations.

#### PROVIDING RELIABLE, CLEAN ELECTRIC POWER

One of the challenges we face is meeting the growing demand for electric power, particularly in the West. The Western Governors Association has estimated that over 50,000 MW of new electric power generation will be needed to meet growing demand in the next decade. How we meet these needs will have profound consequences for Nevada, the West and the Nation.

DOE's proposed budget seems to make some clear and rather abrupt choices regarding future power production options. The DOE Budget documents asserts: "Few technologies provide clean, reliable, baseload electricity—only nuclear power" (DOE fiscal year 2007 Budget presentation Power Point, page 6).

It is true that few technologies can provide electricity that is clean, reliable, and baseload—many technologies suffer from problems with intermittent generation and offer only peaking support. But, the Department's budget inexplicably increases funding for these intermittent technologies while completely gutting the most promising renewable technology that can provide reliable baseload power—geothermal energy.

The Department's own Geothermal Program Strategic Plan stresses these values of geothermal energy. It states:

"The Earth houses a vast energy supply in the form of geothermal resources. These resources are equivalent to 30,000 years of energy for the United States at current rates of consumption. However, only about 2,600 MWe of geothermal power is installed today. Geothermal has not reached its full potential as a clean, secure energy alternative because of concerns or issues with resources, technology, commitment by industry, and public policies. These concerns affect the economic competitiveness of geothermal energy.

"The U.S. Department of Energy's Geothermal Technologies Program seeks to make geothermal energy the Nation's environmentally preferred baseload energy alternative. The Program's mission is to work in partnership with U.S. industry to establish geothermal energy as an economically competitive contributor to the Nation's energy supply."

But, the geothermal strategic plan indicated that the program could not reach its goals until at least 2040 because of its limited funding. It went on to say that "Doubling the Program's budget" would accelerate achieving the program goals and they could "be attained by 2020, resulting in an overall budget savings of \$100 million."

Sounds like doubling the geothermal research program would be a good investment!

If the Department's researchers felt they could bring tens of thousands of megawatts of reliable, baseload geothermal power on-line by 2020 with a doubling of the budget, you would think that recommendation would receive top priority. But

it obviously didn't. Instead, the Department of Energy budget has proposed to zero-out the geothermal program. It has chosen to undermine progress in a technology that can effectively compete with nuclear power or fossil fuels to provide reliable electric power.

Why? What rationale could possibly support such a decision? Well, Secretary Bodman explained to the Senate Energy Committee: "While the budget proposes increases for Biomass, Solar and Hydrogen research, the Geothermal Program will be closed out in fiscal year 2007 using prior year funds. The 2005 Energy Policy Act amended the Geothermal Steam Act of 1970 in ways that should spur development of geothermal resources without the need for subsidized Federal research to further reduce costs."

So is DOE blaming Congress! We simply went too far in the Energy Policy Act supporting geothermal energy, and now it doesn't need DOE support?

But, let's compare these choices for a moment. DOE proposes \$0 for geothermal energy, but it has asked for \$632.7 million for nuclear energy activities. I guess EPAct didn't take care of nuclear power as well. But, that doesn't seem to be the case. Here for the record is how the Senate Energy Committee views the highlights of EPAct's provisions supporting nuclear energy and geothermal energy:

*"Highlights of the Energy Bill—Senate Energy Committee*

*"Nuclear Power*

"Nuclear energy is the world's largest source of emission-free energy. Nuclear powerplants produce no controlled air pollutants, such as sulfur and particulates, or greenhouse gases. The use of nuclear energy in place of other energy sources helps to keep the air clean, preserve the Earth's climate, avoid ground-level ozone formation and prevent acid rain.

"The bill has several provisions to ensure that nuclear energy remains a major component of the Nation's energy supply. Nuclear power currently provides 20 percent of America's electricity. It is our cheapest form of electricity, second only to hydropower. It is one of our safest, most reliable and cleanest energies.

"The energy bill offers a 1.8 cent per kilowatt hour production tax credit for electricity produced by new nuclear power. This applies only to the first half dozen advanced nuclear powerplants.

"It offers federal loan guarantees for innovative technologies—including new advanced nuclear reactors—that will diversify and increase energy supply while protecting the environment. These guarantees are available only for new technologies that provide clean energy and protect the environment. Those seeking guarantees pay into the U.S. Treasury a sum equal to the financial risk assessed by the CBO, thus not costing taxpayers a dime.

"Establishes standby support framework through the DOE for new nuclear plant construction against regulatory or judicial delays for six reactors. This standby support would cover the delay before plant is put into operation.

"Extends Price Anderson liability protection is extended through 2025 for both NRC licensees and DOE contractors.

"Creates a stand-by support program to ensure that consumers do not have to pay higher electricity bills because of unforeseen delays in the construction of new nuclear powerplants due to bureaucratic red tape or litigation. The program insures the utilities for the cost of these delays.

"Provides for the export of high enriched uranium to Canada, Belgium, France, Germany or the Netherlands for the sole purpose of producing diagnostic and life saving medical isotopes until a low enriched uranium alternative is commercially viable and available.

"Requires the DOE to propose a permanent disposal facility to Congress for Greater Than Class C waste within one-year of enactment.

"Strengthens security of nuclear facilities, including improved federal oversight of plant security and the expansion of federal statutes for sabotage of nuclear facilities."

*"Geothermal*

"Geothermal energy is an abundant energy in various parts of the country that is under-utilized. Geothermal energy is clean, renewable and, in countries like Iceland, is a primary source of energy.

"The energy bill creates a competitive geothermal leasing program that allows the private sector—not just government geologists—to identify geothermal areas for leasing. The program is intended to bring geothermal energy to the market sooner.

“The bill also includes incentives to counties to encourage geothermal development by allowing them to keep a percentage of the royalties from that development.”

Well, at least according to the Senate Energy Committee EPAct seems to have done a lot more for nuclear power than geothermal energy. Given the Secretary’s statement justifying terminating the geothermal research program, perhaps he should take another look at whether the Department needs to continue its nuclear power programs. Or, for that matter, perhaps other programs as well.

Questions: Department officials have also claimed that the fiscal year 2007 budget does not reflect the directions it was given in EPAct because their budget was formulated before the new law was passed. Yet, apparently the Department can move fast enough to terminate the geothermal research program based on EPAct. Can the Department explain how EPAct figured into its fiscal year 2007 budget deliberations and provide any studies or other documents that assesses in a comparative fashion the provisions of EPAct and the Department’s research programs? When does the Department intend to implement the new initiatives in EPAct—including new initiatives that direct increased funding for renewable energy research, including geothermal energy?

#### CONTRADICTIONS TO OTHER STUDIES AND ASSESSMENTS

The decision to close out the geothermal research program also appears to contradict the recommendations of the last external review of the Department of Energy’s renewable programs, the 2000 report of the National Research Council entitled *Renewable Power Pathways*. That National Research Council’s examination of the geothermal program states in clear terms the importance of the program, and the recommendation that it continue to be funded: “In light of the significant advantages of geothermal energy as a resource for power generation, it may be undervalued in DOE’s renewable energy portfolio.”

But, the Department of Energy seems not to agree with this assessment. In other budget documents the Department presents another rationale for closing out this program. Basically, it sees geothermal energy as a “regional resource” with limited applicability. (see [http://www1.eere.energy.gov/ba/pdfs/fiscal\\_year\\_2007\\_budget\\_brief.pdf](http://www1.eere.energy.gov/ba/pdfs/fiscal_year_2007_budget_brief.pdf).)

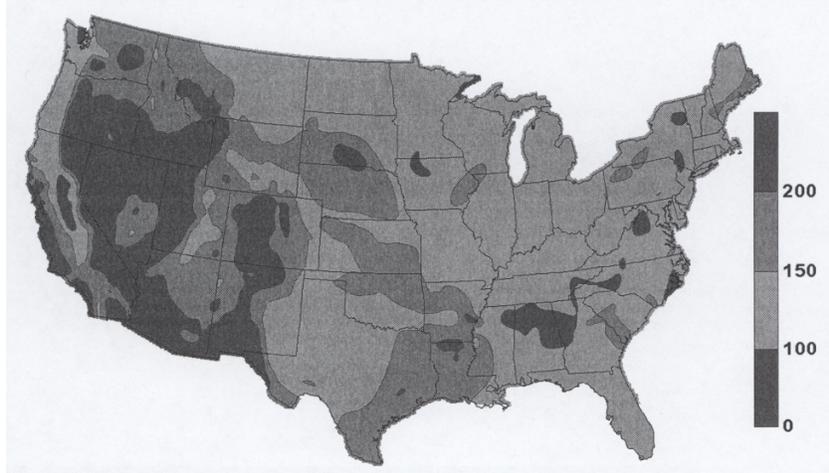
Somehow this represents a change in views at the Department of Energy. The Department’s 2003 Strategic plan included geothermal energy research as part of its efforts to “Improve energy security by developing technologies that foster a diverse supply of reliable, affordable, and environmentally sound energy . . .”. Geothermal power was part of DOE’s “long-term vision of a zero-emission future in which the nation does not rely on imported energy.”

Obviously, something has changed. Somehow, the geothermal resource has shrunk in the past 3 years! Quite an amazing phenomenon, which probably deserves some explanation. Today, geothermal resources are used in 25 States for power and direct use purposes (not including heat pumps) and advanced technology has the potential to bring geothermal power in use across the country.

The Department used to consider the future potential of geothermal energy to be quite significant. Today, we produce about 2,800 Megawatts of power from geothermal resources, and the power potential alone was estimated to be many times that amount. The DOE Geothermal Strategic Plan used to say:

“The U.S. Geological Survey estimated that already-identified hydrothermal reservoirs hotter than 150°C have a potential generating capacity of about 22,000 MWe and could produce electricity for 30 years.<sup>1</sup> Additional undiscovered hydrothermal systems were estimated to have a capacity of 72,000–127,000 MWe. At depths accessible with current drilling technology virtually the entire country possesses usable geothermal resources (Figure 1). The best areas are in the western United States where bodies of magma rise closest to the surface.”

The Department’s strategic plan included a very interesting map that showed the potential of heat in the earth to contribute to our energy needs. As the map shows, DOE used to view the technical potential of geothermal energy to span the entire country from Maine to California.



Questions: Does the Department agree with the National Research Council that the US geothermal resource base holds significant potential to contribute to national energy needs? What actions did the Department take to implement the recommendations made by the National Research Council in 2000? Has the Department had further communications with the NRC about its assessment and any follow-up by the Department? Please provide any documents supporting these actions and communications?

—How does DOE view the potential of geothermal resources? What has happened in the past three years to apparently change the Department's views of the geothermal resource base and its potential?

—What resources does the Department now consider economic: hydrothermal, hot dry rock, geopressured, magmatic, others?

—The Department had indicated that there were many technological challenges to achieving production from the vast geothermal resource base. Does the Department now consider these challenges are solved or does the Department have new information that indicates its prior assessments of geothermal resources are incorrect?

#### OMB RATIONALE

The Office of Management and Budget, with whom I presume the Department coordinates its budget, seems to offer some additional rationales for terminating the geothermal research program. They are just about as interesting as those presented by the Department itself. There appear to be three main assertions by OMB:

—(1) geothermal technology is "mature" and doesn't really need more R&D,

—(2) the change in leasing royalty structure from 50/50 to 50/25/25 will make a substantial difference, so research isn't needed,

—(3) the forthcoming resource assessment by USGS will solve the industry's exploration problems.

—(4) with new tax incentives, geothermal power does not need research support.

With only a very small fraction of the "hydrothermal" resource base not in use, it seems self-evident to me that most of the vast geothermal resource base is not economically useable with today's technology.

Questions: How did the Department determine that geothermal technology was mature and did they apply this same test to all other technologies in the Department's portfolio?

—Would the Department provide to the Committee any studies it has done of technological maturity and a chart showing the comparable maturity of all of the technologies it proposes to fund and not to fund?

—How did the Department decide that nuclear energy, which provides 20 percent of the electricity in the United States, was somehow not mature while at the same time deciding that geothermal energy, which provides 0.5 percent of the electricity in the United States, was mature?

## ROYALTY CHANGES

Regarding the changes in EPAct to Federal royalties, let me say that I support those changes since they will provide needed support for counties in the West to provide the infrastructure needed for energy development that benefits the entire Nation, and these funds will help mitigate for the socioeconomic impacts of new development on the local community.

But, it is far from obvious to me how splitting the Federal share of the royalties with the local government is going to make a lot of difference to the climate for geothermal development. It is even less clear how doing so is going to help us with our needs for new exploration/characterization/resource-management technology. This is really an “apples and oranges” argument. If I have a broken furnace, it’s nice if you buy me a new sofa—but it won’t keep my house warm.

Also, the budget also proposes to repeal this provision of EPAct anyway! Perhaps the Department could clarify this situation. I’m almost afraid to ask.

## USGS RESOURCE ASSESSMENT

The next rationale—that the USGS national resource assessment will solve the industry’s exploration needs—seems to beg questions about what it is that the USGS really plans to do and how much funding they will have to do anything. Does the Department of Energy presume that the USGS national resource assessment will discover new resources or develop new exploration technology?

It’s been my understanding that USGS will not engage in any significant new exploration activity. What they will do is “assessment” by examining existing field data (much of which was available clear back in the 1970’s when Circular 790 was written) and re-interpret it in light of more modern concepts about how geothermal systems are likely to behave, and in light of field data that has been acquired by industry since that time. The purpose is to come up with a more realistic appraisal of how much identified geothermal potential there really is, and where it is located.

However, I understand that this will be a study involving little or no new field work, no exploration drilling, and no exploration technology development or verification. The essential fact is that the USGS assessment, while important and potentially useful for planning purposes (i.e., the WGA study and policy pronouncements by organizations like EIA), is not likely to discover any genuinely NEW resources.

Questions: Does the Department of Energy presume that the USGS national resource assessment will discover new resources or develop new exploration technology?

- Please explain and detail any new exploration or technology development anticipated to be undertaken by the USGS in the conduct of its new national resource assessment? Please discuss the support, to date, from DOE for these efforts and the plans, if any, for continued support by DOE for this effort?
- My understanding from the industry is that a critical need is better exploration technology, and that this is an area where technological breakthroughs could be made. What information does the Department have to support its assertion that private industry will develop this technology in the next few years without government research support?

## TAX INCENTIVES

Another interesting conclusion that OMB has come to is that with the new tax incentive offered geothermal power, there is no need for more research funding. The new tax incentive is the addition of geothermal technology to the list of those eligible for the Production Tax Credit. Notably, wind and biomass have been eligible for the production tax credit since 1992, but neither of those programs is proposed for termination. Also, the current production tax provision expires in 2 years.

I have several questions about this rationale.

Questions: Does the Administration now support having new geothermal facilities eligible for the full production tax credit? When did the Administration make this policy change, and where was it communicated?

- Does the Administration now support making the production tax credit permanent? Why wasn’t this reflected in the Administration’s fiscal year 2007 budget?
- What information, analysis, or other information does the Department have that supports its assertion that this tax credit substitutes for the need for federal research support? How has the Department applied this measure across the technologies within its research portfolio, and would the Department provide a chart comparing the tax treatment provided by law for the technologies in its research portfolio?

## INTERNATIONAL COMPETITIVENESS

Finally, I would ask about the impact of the proposed research cuts on the international competitiveness of the geothermal industry. It's my impression that the U.S. industry has been a world leader in geothermal technology, helping develop billions of dollars of projects around the world.

In fact, in addition to calling for an expanded geothermal research program, the National Research Council's Renewable Power Pathways report stresses how the United States is the world leader in geothermal technology and that the direction DOE takes with its research program has real consequences for this situation. Their NRC report states: "the United States has taken the lead in successful commercial demonstrations of geothermal energy for generating electricity and heat at several sites and is the current technology leader in the world among very active competitors in Europe and Japan." They go on to warn "U.S. leadership may be short-lived because the U.S. R&D program is now much smaller than those of overseas competitors."

Questions: Is it a fair assumption that with total elimination of the DOE research program, U.S. leadership in geothermal technology will be lost in a fairly short period of time?

—Isn't this contradictory to the emphasis that the Administration is placing upon science and technology as underpinnings for our economy and our future?

## CONCLUSION

Geothermal energy is an important resource for the Nation. We have only begun to tap this vast resource. We should not be cutting back on geothermal or other renewable resources efforts. We instead should be expanding our effort to use this resource in all of its forms more effectively. That means making the Federal production tax credit permanent for geothermal and other renewable technologies, expanding our resource assessment efforts by USGS and supporting State agencies and university research centers, and increasing funding for geothermal research and outreach by the Federal Government.

Senator DOMENICI. Thank you very much, Senator.

We will proceed now. Let me ask, does any other Senator want to make a brief statement before I make mine on your side? A brief one or a long one?

Senator MURRAY. A brief one.

Senator BOND. I have a long one.

Senator DOMENICI. You will wait for your turn?

Senator BOND. I will wait for my turn.

Senator DOMENICI. Okay. I do not even remember what your issue is here today. You have got a couple of them.

Senator BOND. Coal.

Senator DOMENICI. Coal.

Senator BOND. Coal.

Senator DOMENICI. The lack of funding for coal in the budget, is that it?

Senator BOND. You guessed it. Boy, you just blew my whole story.

## STATEMENT OF SENATOR PETE V. DOMENICI

Senator DOMENICI. All right. Let me start once again and back up for a minute, thanking the Senator for his comments. It is true we do try to work together on this issue. I do not purport here today for the press—I am not going to answer the points that have been raised by the distinguished Senator. Obviously we have some very serious disagreements. We have some ideas that seem to be merging in terms of where things are going.

Having said that, I want to thank Dr. Ray Orbach and Secretary Garman for being here today. Dr. Orbach is the current Director of the Office of Science and the President's nominee for the newly

created position of Under Secretary of Science. Dr. Orbach, it is just a matter of things clearing here and then you will receive your new title. So I hope you are acting like you are an Under Secretary.

Dr. ORBACH. No.

Senator DOMENICI. You are not? Well, we will let the world know that as far as this committee is concerned you are, and the Senate is going to do that pretty soon.

Secretary Garman, we are delighted that you have had time now to really get your feet wet in this office. It is a tough one. You have got a big, big agenda, everything from energy efficiency, renewables, the Office of Nuclear Energy, Office of Electricity Delivery and Reliability, Office of Fossil and R&D and Environment Management Activities.

It is nice to see you again, and we welcome you to the committee. We hope you are enjoying the work, but we hope you understand that you have a terribly difficult job put on your shoulders, and you are going to have to tell us today that you are pushing hard for some of the very tough things that have to be done.

In the State of the Union the President announced an American Competitive Initiative and Advanced Energy Initiative. These initiatives recognized that the Department's long-term investment in physical sciences and energy R&D were of utmost importance. I am also pleased to see an increasing level of cooperation between the Office of Science and Energy Research and Development in their efforts to solve our energy needs. I believe the bioenergy and hydroenergy initiatives are a good example of this cooperative investment. I hope it continues. I think its synergism will yield big results.

The American Competitive Initiative commits \$5.9 billion in 2007 and more than \$137 billion over 10 years to programs that help America retain its leading edge in science, math, and technology. The ACI, as it is called by the President, will increase investments in research and development, education, tax incentives to encourage innovation within this Department of Energy that you now try to manage under the able direction of the Secretary.

This translates to \$505 million increase from 2006 levels to a \$4.1 billion 2007 level for the Office of Science. I assume, Dr. Orbach, that you relish and look forward to such an increase. Is that correct?

Dr. ORBACH. Yes, sir.

Senator DOMENICI. I saw you smile, so I thought you might just as well talk.

The President also announced an Advanced Energy Initiative, which aims to reduce America's dependence on imported energy sources and commits \$2.1 billion to meet the goal, an increase of \$381 million.

The President recognizes that research and innovation are America's best answer to the voracious global appetite of carbon fuels, which my friend Senator Bond is here to talk about, obviously. Thanks to the work of the Department, our Nation will be able to produce more energy from nuclear power, wind, sun, and our own field crops in the coming years. These are not little actions, but rather, combined, could be gigantic steps toward America's minimizing its dependence upon foreign carbons, foreign sources of

crude oil, to run our machine, our transportation and economic machine.

I commend the President for his efforts to make tough choices with the funds available. However, I am concerned about several programs and they are big; they are important and they are vital to our energy independence and they did not receive sufficient funding. Specifically, I am concerned about the shortfall in funding for the nuclear R&D funding, the clean coal power initiative, and the several provisions within the EPAct that will support development of new alternative energy technology demonstrations. Clearly, we put them in in the Energy Act. The President has not funded them to the extent that many of us thought he should.

The Office of Nuclear Energy—there are shortfalls in the Nuclear Power 2010, Next Generation nuclear programs, that will inhibit our ability to fully realize a revival in this nuclear power agenda. NP 2010 program is critical to demonstrating its first of a kind combined construction-operating license process with the Nuclear Regulatory Commission. This cost is shared, is a shared activity, which the Department is not living up to, will not be able to, as to its share of the deal. The nuclear powerplant Next Generation received \$23 million, down \$16 million. That is a rather sharp cut.

This budget process proposes to cut clean coal power initiative from \$49.5 million this year to \$5 million for 2007, almost you could say doing away with it. Ninety-five percent equals 100 percent, I imagine, in a program like this.

The United States has a 250-year supply of coal. Protecting the technology to burn coal at a minimal impact is critical to the economic and global competitiveness of this great Nation. I question the wisdom of this and hope you can explain it. There may be a short-term explanation or there may be a catch-up explanation. We need that.

Another area of concern under the Energy Policy Act is that this legislation provides incentives. I direct this at you again, Mr. Under Secretary. These incentives are in the form of loan guarantees. You are aware of that. You helped us write it. You know how important we thought they were going to be in all of the clean energy technologies, including clean coal, biomass, and new nuclear powerplants.

America's business stands ready, as we understand it, to develop new and innovative sources of energy under this program. But progress is either stalled or not moving rapidly enough to provide the guidelines or the process for applications for loans. It does no good for someone to have a new project, and we developed a no-cost-to-Government loan program, and not have them available. We need to know today when they are going to be available.

So, Secretary Garman, this is one you are going to have to work with us today and you are going to have to continue until it is done. If you need some help from us, we are here. We will also speak of weatherization. You know there is a problem there. That is out in the open. I do not need to raise it here myself.

I am deeply concerned about the \$762 million cut to the environmental management program. That brings the distinguished Senator from the State of Washington here today. It also has one that hits at my heart too this time, so we may be on the same path.

We may be trying to succeed together. I do not know. But \$762 million cut in that program? I recognize that we have completed Rocky Flats, right, a very good sign. You can hold up a flag and say for the first time, I think partly because Colorado was a great host State and worked collaboratively, we have a very big solution.

But that does not mean that a \$762 million reduction in the remaining programs can be sustained. I am concerned about the current status of the waste treatment facility in Washington. I do not have the answers, but clearly we have to stay on this until it becomes a success like Rocky Flats maybe. Most of us will be gone by then, but let us say that we ought to at least wish for that day.

I am aware the cost estimates exceed \$11 billion and I hope you can explain the Department's strategy for addressing this skyrocketing cost. I also must tell you that I am vitally interested to know how the Department intends to fulfill its commitment—and you must listen carefully to this—under a consent agreement with the State of New Mexico for cleanup at Los Alamos. Funding for this project has been cut by \$50 million. Now, I do not know how we do that. I mean, we have done it in the past. We just ignore a court decree. But it happens to be in the chairman's State. That does not look too good, does it, I do not think. But anyway, we are going to work on it, right?

Let me say in closing about Yucca Mountain, I am concerned about the slow progress for the completion of the facility. I understand that the license application will not be ready until 2008. That is just getting the application ready. That does not mean anything has happened. I am aware that the administration is working on new legislation which authorizes a different approach to the repository. I have told them repeatedly that I will introduce it in their behalf so as to push it with some degree of vigor. That does not mean I will support it wholeheartedly. But we must see what it is.

Dr. Orbach, Secretary Garman, you have an important job in front of you, delivering on the President's promise of an American Competitive Initiative. You are aware that you are not the whole initiative. You are team players. I know you both have statements on all of this. You can expect questions on many of it, so do not try to cover them all. I would like you to try to summarize in 10 minutes if you can do that, and then right now I will include your full statement in the record.

We will start with you, Mr. Secretary. No, we will not. We will start with Senators. Okay, we are going to go with you, Senator.

STATEMENT OF SENATOR PATTY MURRAY

Senator MURRAY. Thank you, Mr. Chairman, and good morning to both Under Secretary Garman and Dr. Orbach. I know we have a lot of ground to cover, so I will keep my statement brief.

I just wanted to say that I am a long-time advocate of increased funding for the Office of Science and I am pleased to see the administration has requested \$4.1 billion, a 14 percent increase over fiscal year 2006. That is good news. For the United States to continue to be a leader in the sciences, we have to make the decision to invest in our own future.

I was also relieved to see a request of \$690 million for the waste treatment plant. This construction project is the cornerstone to cleaning up Hanford and we have to get it back on track. However, this budget has some gaps, including the \$52 million reduction of funds for the tank farm activities. Secretary Bodman described the radioactive wastes on that site as among the most dangerous chemicals known to man. That was waste that was created during World War II and the cold war and Washington State has fulfilled its national duty during those times, and now the Federal Government has a responsibility to fulfill its national duty to clean up that site. It is about protecting the health and the welfare of the region and the people who live there.

Under Secretary Garman, I read your written testimony last night and I just wanted you to know I take issue with your statement where you say, "It surprises many to learn that we spend more each year to clean up Hanford, roughly \$1.8 billion, than we do annually on our entire portfolio of applied energy research and development, which is approximately \$1.5 billion. To put it bluntly, this is a budget that begins to put the energy back in the Department of Energy."

Well, Mr. Garman, it sounds to me like you are suggesting that our efforts to clean up the polluted sites in the Nation are coming at the cost of Federal energy R&D, and it is sort of a slap in the face to the people of Washington State to imply that their need for clean air and clean water and cleanup of this critical site and their contribution to winning a war is detracting from the investments in the Federal R&D portfolio.

I want to remind you this Nation has a moral and a legal obligation to clean up Hanford site, and if there is a belief that the Federal investment in applied energy R&D has been lacking in recent years it is because the administration has made that choice every year with its budget proposals. We have to fulfill our obligations to clean up and we need to invest in R&D. One does not preclude the other.

So I just wanted to make that clear and I do have a number of questions I will be asking when we get to that round.

Senator BOND [presiding]. Senator Allard.

#### STATEMENT OF SENATOR WAYNE ALLARD

Senator ALLARD. Thank you, Mr. Chairman, for holding this hearing today. As you know, I am co-chairman of the Senate Renewable Energy and Energy Efficiency Caucus and represent the State which the National Renewable Energy Laboratory calls home. As a scientist myself, I have always been a strong supporter of research funding in all areas.

For these reasons I have a special interest in today's hearing. Today more attention is being focused on clean energy and energy efficiency technologies. This is a time when the development of alternative energy sources is becoming more important than ever. We must continue to provide incentives for the implementation of renewable technologies and for the infrastructure necessary to support these renewable sources.

These technologies are a necessary step in balancing our domestic energy portfolio, increasing our Nation's energy security, and

advancing our country's technological excellence. Renewable energy is a very important way that we can begin to reduce the demand for oil and thereby help to make our country more secure. There are great opportunities for solar, wind, geothermal, biomass, fuel cells, and hydro to make significant contributions. Research and the input of both Government and industry entities is very important to allowing these opportunities to live up to their potential.

The National Renewable Energy Laboratory in Colorado can and does make an incredible contribution to the development of these resources. Technologies being developed at NREL, whether providing alternative fuels and power or making our homes and vehicles more energy efficiency, are vital to our Nation's energy progress.

But what is really unique about NREL is that their focus is for moving research and scientific discovery to the market. That means that the money that we spend on science is being designed in a practical way to help Americans and American consumers. I think that is very unique about the National Renewable Energy Laboratory that we have in Colorado.

Recently, due to an abundance of earmarks, NREL was faced with dramatic funding cutbacks that resulted in lost jobs. The Department did everything it could to mitigate the job losses, but we still lost 32 positions. Thankfully, DOE was able to find an additional \$5 million and these jobs were restored. I would like to thank you, Mr. Garman, who is here today, Secretary Bodman and everyone at DOE and NREL for working to make that situation right. I hope to work with DOE and my colleagues on this subcommittee to see that a situation like this does not happen again.

I was also very disappointed to learn that much of the money being saved by the accelerated cleanup of Rocky Flats has not been given to other DOE cleanup sites for accelerated cleanup. As I understand the DOE's fiscal budget 2007 request, the environmental management account has been reduced by over \$740 million from the amount appropriated in fiscal year 2006. It has always been my understanding that the money saved by accelerating Rocky Flats would be used for the cleanup of other sites. We were spending over \$500 million at Rocky Flats alone. This was one of the reasons Senator Domenici and others were willing to support accelerated cleanup of Rocky Flats.

PREPARED STATEMENT OF SENATOR WAYNE ALLARD

I look forward to working with the committee to ensure that R&D in all fields of energy technology are funded in a manner that is responsible, but sufficient to ensure that the development and implementation of new technologies continues.

Thank you, Mr. Chairman.  
[The statement follows:]

PREPARED STATEMENT OF SENATOR WAYNE ALLARD

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Renewable energy is a very important way that we can begin to reduce the demand for oil and, thereby, help to make our country more secure. There are great opportunities for solar, wind, geothermal, biomass, fuel cells and hydro to make significant contributions. Research and the input of both government and industry entities is very important to allowing these opportunities to live up to their potential.

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I look forward to working with the committee to ensure that R&D in all fields of energy technology are funded in a manner that is responsible, but sufficient to ensure that the development and implementation of new technologies continues.

Senator DOMENICI [presiding]. Thank you very much, Senator, and you are to be commended on the work you did with reference to Rocky Flats, truly an example of great cooperation.

Senator ALLARD. Well, Mr. Chairman, as you know, this would not have happened without your cooperation and the other sites around the country. It was because of everybody working together. The idea was that when we got this cleaned up that money was going to be available for other sites to accelerate their cleanup, to do things that are actually going to lead to cleanup like we experienced at Rocky Flats. So thank you.

Senator DOMENICI. Now, Senator Bond.

#### STATEMENT OF SENATOR CHRISTOPHER S. BOND

Senator BOND. Thank you very much, Mr. Chairman. I appreciate the opportunity to comment. As you have already so well stated, Mr. Chairman, our Nation's energy problems are as serious as ever. Over the past year we have experienced record prices for crude oil, natural gas, gasoline, and diesel fuel, at least in part due to the devastation of Hurricane Katrina. But it has pointed out how fragile our energy supply is.

Again, as the chairman has noted, the simple fact of the matter is that our Nation's energy supplies are not keeping up with demand. We are importing more oil and natural gas than ever and we are doing very little to develop our own domestic sources of energy. There are solutions to the problems. In addition to strong con-

servation measures, we need to increase our domestic supplies of energy in oil, in gas, and nuclear power, and we must also develop alternative and renewable sources of energy.

But I am particularly focused on the use of coal and the development of new and cleaner coal-based technologies to provide us with the alternative resource to meet our Nation's growing energy needs. Coal already provides more than half our Nation's electricity and it is the largest single source of overall domestic energy production at more than 31 percent of the total.

Coal, as we all know, can be converted through proven, existing, modern technology into clean zero-sulfur synthetic oil and oil products at roughly \$35 a barrel, compared to the current \$65-or-so price per barrel of oil. Coal liquefaction or coal-to-liquid refineries can be located anywhere that coal is produced. This proven technology can produce clean transportation fuels using domestic coal, thereby expanding our supply of transportation fuels while decreasing our dependence on foreign sources of energy. This includes gasoline, diesel, and other liquid fuels.

We are looking forward to the report from the Coal Council that I believe will put us on the path to independence from overseas import of oil and gas by 2025.

Now, the great thing about coal-refined diesel fuel is it will be low in sulfur. It will come out cleaner, enable refiners to meet the clean air requirements, and help the public lead healthier lives.

Now, a lot of us were really encouraged to hear the President highlight the importance of increasing this investment in clean coal technologies and zero emission coal-fired plants in his State of the Union Address in January. High hopes. The President's Clean Coal Power Initiative represents an important first step in the development of clean coal technologies. Nevertheless, that euphoria was met with the stunning news when we saw that the 2007 budget request for coal research initiatives and the Clean Coal Power Initiative. As you know, title IV of the Energy Policy Act of 2005 authorizes \$200 million for the Clean Coal Power Initiative in 2007, but the President's budget request comes out at only \$5 million for this important program, over a \$44 million cut.

I hope that someone here can tell OMB about the President's Clean Coal Power Initiative. It would be very helpful if the right hand knew what the left hand was doing. The CCPI is a cooperative, cost-shared program between the Government and industry to demonstrate emergency technologies in coal-based power generation, to accelerate commercialization. Technologies are selected with the goal of accelerating development and deployment of coal technologies that will meet environmental standards in a cost effective manner.

The prior years' appropriations have enabled the Department of Energy to conduct two clean coal demonstration programs during the past 6 fiscal years, but the \$5 million proposed by OMB for this program will not even allow the DOE and industry to conduct a demonstration project every other year. Our researchers may develop clean coal technologies in the lab, but unless they can demonstrate these technologies we will not see the progress.

I believe the Clean Coal Power Initiative should be funded at least \$150 million to conduct another clean coal demonstration

project in the near future. With over 250 years worth of recoverable coal reserves in the United States, coal is without question our Nation's most abundant resource. It is estimated that these coal reserves are equivalent to roughly 800 billion barrels of oil, making the United States the Saudi Arabia of coal. Those of us in the heartland who take pride now that through ethanol and soy diesel we are beginning to make a contribution to our energy needs, see the potential that the coal that we have throughout the Nation, not only the Midwest, but in Alaska and all over, can be realized, making us energy producers rather than just energy consumers.

In light of the growing global demand for oil and gas, our Nation's increased dependence on foreign sources of energy, and our abundant supply of domestic coal, I think it is imperative we promote and adequately fund clean coal technologies to meet the Nation's urgent needs for reliable and affordable sources of energy.

The coal research initiative and the clean coal power initiative administered by DOE are vital to the future use of our Nation's most abundant fossil fuel resources and they must be adequately funded. The budget that we were presented just does not do that.

I will leave a question for the record that will come as no surprise, I am sure. Mr. Garman, you may want to address it in your remarks, but my question would be: In light of the small amount of the funding for the program, is the administration truly serious about promoting clean coal technologies in its effort to reduce dependence on foreign oil and promoting energy independence?

Thank you, Mr. Chairman, my colleagues, and I thank you, gentlemen.

PREPARED STATEMENT OF SENATOR THAD COCHRAN

Senator DOMENICI. Thank you, Senator. Senator Cochran has also submitted a statement which will be included for the record. [The statement follows:]

PREPARED STATEMENT OF SENATOR THAD COCHRAN

Mr. Chairman, I appreciate your holding this hearing to review budgets of the Department of Energy's Office of Science, Office of Nuclear Energy, Office of Fossil Energy, Office of Environmental Management as well as many other important accounts with the Department of Energy. I want to join you in thanking the witnesses for being here to provide testimony and answer questions.

I am pleased that the Department is continuing to look for alternate and renewable sources of energy to correct the trend toward unnecessary reliance on foreign sources of oil and gas. My State continues to conduct research to develop cleaner and more efficient sources of energy. After Hurricane Katrina, fuel costs rose as much as \$3 per gallon and finding diesel to transport necessities or to run the electrical generators used to cool poultry production facilities became a challenge. Our biodiesel suppliers provided this needed fuel which proved not only to be a cleaner fuel, but a fuel that is a substitute for foreign oil.

Mr. Chairman, I look forward to working with you this year on these important accounts as well as the new American Competitiveness Initiative and the Advanced Energy Initiative.

STATEMENT OF DAVID K. GARMAN

Senator DOMENICI. Now we will proceed. Under Secretary Garman, please let us hear from you at this point.

Mr. GARMAN. Well, it is clear from the opening statements from the Senators that I am going to be on a bit of the hot seat this

morning and it does not pay me to belabor that any with a long statement. So I will be extremely brief. I would just like to take 4 minutes to stress just a few key points.

If you ask me to distill this entire DOE budget, with all its puts and takes, into a single theme or concept, it would be that we are emphasizing science, research and development in pursuit of transformational energy technologies. This budget significantly increases our investments in clean energy research and the fundamental science to support that research. We have proposed some significant increases in areas such as: applied solar energy research, up 78 percent; applied biomass research, up 65 percent; applied hydrogen research, up 42 percent; and applied nuclear energy research, up 56 percent.

We have also proposed, as you have noted, a significant increase in basic energy sciences under the Direction of Dr. Orbach, recognizing that we must strengthen the connections between our basic and applied energy work. We are determined to make the activities in basic sciences more relevant and more strongly linked to the applied energy programs working to advance practical energy technologies, such as solar, nuclear, hydrogen, and biomass.

Because these increases have been sought within an overall departmental budget that is level funded, we have had to propose some reductions in some otherwise worthy programs—low income weatherization comes to mind—because we felt it was important to articulate priorities and make those tough calls mindful of the practical limitations on discretionary spending that you as appropriators face.

As you all know, the Department of Energy could more accurately be referred to as the Department of Nuclear Weapons, Radioactive Cleanup, Science, and Energy, in that order, if the Department's name were to more accurately capture its activities and the priority placed on them as reflected by our levels of spending on those activities.

I do not mean, Senator Murray, and I hope you do not take my statement as you did—we did not intend or I do not intend to say that we are going to somehow shirk our environmental obligations. We take on those obligations. We know those obligations are ours. In saying that we spend less on applied energy research at the Department than we do on things such as the cleanup of Hanford, I am not suggesting that we should spend less on the cleanup at Hanford. I am suggesting rather we should be spending more on applied energy research, and that was the point of the statement and I hope you do not misconstrue. I did want to make that clear.

This is a budget that does begin to put energy back in the Department of Energy, not just in the applied energy programs but in the science programs managed by Dr. Orbach that can contribute totally new thinking and new approaches in meeting our energy challenges. And at a time when this Nation is as concerned as it is about energy security and clamoring for new energy solutions, we should strive to do nothing short of that.

#### PREPARED STATEMENT

With that, Mr. Chairman, I can either go into some of the things that were raised or just prepare to take the questions and interact.

I am aware of the time constraints of the committee and I want to be respectful of that time.

[The statement follows:]

PREPARED STATEMENT OF DAVID K. GARMAN

Mr. Chairman and members of the committee, thank you for this opportunity to appear to discuss the President's fiscal year 2007 budget request for the Department of Energy (DOE). This testimony will focus on the budget requests for the Office of Energy Efficiency and Renewable Energy, the Office of Electricity, the Office of Nuclear Energy, the Office of Fossil Energy, the Office of Environmental Management, and the Office of Civilian Radioactive Waste Management. But let me first provide some context.

This budget recognizes that science-driven technology is at the heart of the Department of Energy's missions, and that our national laboratories and facilities, together with universities and research activities in the private sector, must be better leveraged to enhance America's national security, economic security, and energy security.

Therefore, we have proposed to significantly increase our investment in science, in keeping with the American Competitiveness Initiative.

We have also proposed to significantly increase investments in clean energy research in areas such as solar, biomass, hydrogen, wind, and nuclear, in keeping with the Advanced Energy Initiative.

Notably, we have proposed these increases within a flat Departmental budget. Since any realistic pursuit of new or enhanced initiatives must be mindful of practical limitations on discretionary spending, we have prioritized our mission activities, which resulted in proposed reductions in areas such as low-income weatherization—not because we regard these as unworthy activities—but because we know that you are as mindful of the constraints on discretionary spending as we are.

As Secretary Bodman has observed, the Department of Energy could more accurately be referred to as the Department of Nuclear Weapons, Radioactive Cleanup, Science and Energy—in that order—if the Department's name were to more accurately capture its activities and the priority placed on them as reflected by our investments. It surprises many to learn that we spend more each year to cleanup Hanford, roughly \$1.8 billion dollars, than we do annually on our entire portfolio of applied energy Research and Development (R&D), which is approximately \$1.5 billion dollars. To put it bluntly, this is a budget that begins to put the "energy" back in the Department of Energy. Not just in the applied energy programs, but in the science programs that can contribute new thinking and new approaches in meeting our energy challenges. We are determined to make the activities in basic sciences more relevant and more strongly linked to the applied energy programs working to advance practical energy technologies in areas such as solar, nuclear, hydrogen and biomass. At a time when this Nation is concerned about energy security and clamoring for new clean energy solutions, we should strive to do nothing short of that.

With respect to the applied energy technologies, the President's Advanced Energy Initiative provides a 22 percent increase for research that can help reduce America's dependence on foreign oil and advance clean energy technologies. The fiscal year 2007 budget proposes \$149.7 million for Biomass and Biorefinery Systems Research and Development (R&D) program to support the new Biofuels Initiative to develop cost competitive ethanol from cellulosic materials (agricultural wastes, forest residues, and bioenergy crops) by 2012. In addition, the budget request continues to pursue the vision of reducing America's dependence on foreign oil, reducing air pollution, and reducing greenhouse gas emissions through the development of new technologies, including hydrogen. The fiscal year 2007 budget requests a total of \$289.5 million (including \$1.4 million requested by the Department of Transportation) to support implementation of the President's Hydrogen Fuel Initiative. The fiscal year 2007 budget also provides a 27 percent increase for advanced battery technologies that can improve the efficiency of conventional hybrid electric vehicles (HEV) and help make "plug-in" HEVs commercially viable.

To help develop clean, affordable electricity, the fiscal year 2007 budget includes \$148.4 million for a new Solar America Initiative to develop cost competitive solar photovoltaic technology by 2015. The fiscal year 2007 also advances the administration's commitment to the FutureGen project, which will establish the capability and feasibility of co-producing electricity and hydrogen from coal with near-zero atmospheric emissions of pollutants and greenhouse gasses.

Any serious effort to stabilize greenhouse gasses in the atmosphere while providing the increasing amounts of energy for economic development and growth requires the expanded use of nuclear energy. This will inevitably require us to address the spent fuel and proliferation challenges that confront the expanded, global use of nuclear energy. Therefore, the Department's fiscal year 2007 budget features \$250 million to begin investments in the Global Nuclear Energy Partnership (GNEP), a comprehensive approach to enable an expansion of nuclear power in the United States and around the world, to promote non-proliferation goals; and to help resolve nuclear waste disposal issues. GNEP is a complex, challenging undertaking that will take many years to realize, which is why the Department proposes to begin research now.

As a complement to the GNEP strategy, the Department will continue to pursue a permanent geologic storage site for nuclear waste at Yucca Mountain, and the fiscal year 2007 budget includes \$544.5 million to support this goal. Based on technological advancements that would be made through GNEP, the volume and radiotoxicity of waste requiring permanent disposal at Yucca Mountain will be greatly reduced, delaying the need for an additional repository indefinitely.

GNEP builds upon the successes of programs initiated under President Bush's leadership to encourage the construction of new nuclear powerplants here in the United States. The fiscal year 2007 budget includes \$632.7 million for nuclear energy programs, a \$97.0 million increase above the fiscal year 2006 appropriation. In addition to the \$250 million for GNEP within the Advanced Fuel Cycle Initiative, Generation IV (Gen IV) research and development (\$31.4 million) will improve the efficiency, sustainability, and proliferation resistance of advanced nuclear systems, and Nuclear Power 2010 (\$54.0 million) will lead the way, in a cost-sharing manner, for industry to order new, advanced light-water reactors by the end of this decade. In addition, ongoing implementation of the Energy Policy Act of 2005 (EPACT) will establish Federal insurance to protect sponsors of the first new nuclear powerplants against the financial impact of certain delays during construction or in gaining approval for operation that are beyond the sponsors' control.

The Department of Energy's budget request remains mindful of our legacy obligations. To meet our environmental cleanup commitments arising from nuclear activities during the Manhattan Project and the Cold War, the budget submission requests \$5.8 billion to clean up legacy nuclear waste sites. DOE has accelerated cleanup at the legacy nuclear waste sites and recently announced completion of cleanup at Rocky Flats, a former nuclear weapons plant located outside of Denver, Colorado. In 2006, DOE will also complete environmental cleanup of the Fernald and Columbus sites in Ohio, and several other sites as well.

To provide better context for programmatic decisions, the Department expanded the development of 5-year budget plans. We still have work ahead of us to make this planning more rigorous and meaningful, but we have made the start.

And at the behest of Secretary Bodman, we are working to institute straight-forward operating principles which set the tone for further improving the management of the Department. These principles are:

- Accept no compromises in safety and security;
- Act with a sense of purposeful urgency;
- Work together, treating people with dignity and respect;
- Make the tough choices;
- Keep our commitments;
- Manage risk through informed decisions.

#### ADVANCING AMERICA'S ECONOMIC AND ENERGY SECURITY

Turning now to some of the specific proposals in the fiscal year 2007 budget, the request of \$1.2 billion for energy efficiency and renewable energy activities reallocates resources to emphasize technologies with the potential for reducing our growing reliance on oil imports and for producing clean electricity with reduced emissions. It includes two new Presidential initiatives; Biofuels and Solar America. The fiscal year 2007 budget proposes \$149.7 million for the Biofuels Initiative to develop by 2012 affordable, domestically produced bio-based transportation fuels, such as ethanol, from cellulosic feedstocks (such as agricultural wastes, forest residues, and bioenergy crops), and encourage the development of biorefineries. Biomass has the promise to deliver a plentiful domestic energy resource with economic benefits to the agricultural sector, and to directly displace oil use. The Solar America Initiative accelerates the development of solar photovoltaics, a technology that converts energy from the sun into electricity. Further development can help this emissions-free technology achieve efficiencies to make it cost-competitive with other electricity genera-

tion sources by 2015. The fiscal year 2007 budget provides \$148.4 million for the Solar Energy Program that comprises the initiative.

In addition to funding increases for biomass and solar energy, the Energy Efficiency and Renewable Energy budget request includes \$195.8 million to support continued research and development in hydrogen and fuel cell technology which holds the promise of an ultra-clean and secure energy option for America's energy future. The increase of \$40.2 million above the fiscal year 2006 appropriation accelerates activities geared to further improve the development of hydrogen production and storage technologies, and evaluate the use of hydrogen as an emissions-free transportation fuel source. The President's Hydrogen Fuel Initiative is funded at \$289.5 million and includes \$195.8 million for DOE's Energy Efficiency and Renewable Energy program, \$23.6 million for DOE's Fossil Energy program, \$18.7 million for DOE's Nuclear Energy program, \$50.0 million for DOE's Science program, and \$1.4 million for the Department of Transportation.

While the budget proposes increases for Biomass, Solar and Hydrogen research, the Geothermal Program will be closed out in fiscal year 2007 using prior year funds. The 2005 Energy Policy Act amended the Geothermal Steam Act of 1970 in ways that should spur development of geothermal resources without the need for subsidized Federal research to further reduce costs.

Nuclear power, which generates 20 percent of the electricity in the United States, contributes to a cleaner, more diverse energy portfolio. In fiscal year 2007 a total of \$632.7 million is requested for nuclear energy activities. Within the total, \$250 million will support the Global Nuclear Energy Partnership (GNEP). GNEP is a comprehensive strategy to enable an expansion of nuclear power in the United States and around the world, to promote nuclear nonproliferation goals; and to help resolve nuclear waste disposal issues.

GNEP will build upon the administration's commitment to develop nuclear energy technology and systems, and enhance the work of the United States and our international partners to strengthen nonproliferation efforts. GNEP will accelerate efforts to:

- Enable the expansion of emissions-free nuclear power domestically and abroad;
- Reduce the risk of proliferation; and
- Utilize new technologies to recover more energy from nuclear fuel and dramatically reduce the volume of nuclear waste.

Through GNEP, the United States will work with key international partners to develop new recycling technologies that do not result in separated plutonium, a traditional proliferation risk. Recycled fuel would then be processed through advanced burner reactors to extract more energy, reduce waste and actually consume plutonium, dramatically reducing proliferation risks. As part of GNEP, the United States and other nations with advanced nuclear technologies would ensure developing nations a reliable supply of nuclear fuel in exchange for their commitment to forgo enrichment and reprocessing facilities of their own, also alleviating a traditional proliferation concern.

GNEP will also help resolve America's nuclear waste disposal challenges. By recycling spent nuclear fuel, the heat load and volume of waste requiring permanent geologic disposal would be significantly reduced, delaying the need for an additional repository indefinitely.

The administration continues its commitment to open and license Yucca Mountain as the Nation's permanent geologic repository for spent nuclear fuel, a key complement to the GNEP strategy. Managing and disposing of commercial spent nuclear fuel in a safe and environmentally sound manner is the mission of DOE's Office of Civilian Radioactive Waste Management (RW).

To support the near-term domestic expansion of nuclear energy, the fiscal year 2007 budget seeks \$54.0 million for the Nuclear Power 2010 program to support continued industry cost-shared efforts to reduce the barriers to the deployment of new nuclear powerplants. The technology focus of the Nuclear Power 2010 program is on Generation III+ advanced light water reactor designs, which offer advancements in safety and economics over the Generation III designs. If successful, this 7-year, \$1.1 billion project (50 percent to be cost-shared by industry) could result in a new nuclear powerplant order by 2009 and a new nuclear powerplant constructed by the private sector and in operation by 2014.

Funding of \$1.8 million is provided in fiscal year 2007 to implement a new program authorized in the recently enacted Energy Policy Act of 2005. The program will allow DOE to offer risk insurance to protect sponsors of the first new nuclear powerplants against the financial impact of certain delays during construction or in gaining approval for operation that are beyond the sponsors' control. This program would cover 100 percent of the covered cost of delay, up to \$500 million for the first two new reactors and 50 percent of the covered cost of delay, up to \$250 million

each, for up to four additional reactors. This risk insurance offers project sponsors additional certainty and incentive to provide for the construction of a new nuclear powerplant by 2014.

The fiscal year 2007 budget request includes \$31.4 million to continue to develop Next-generation nuclear energy systems known as Generation IV (GenIV). These technologies will offer the promise of a safe, economical, and proliferation resistant source of clean, reliable, sustainable nuclear power with the potential to generate hydrogen for use as a fuel. Resources in fiscal year 2007 for GenIV will be primarily focused on long-term research and development of the Very-High Temperature Reactor.

The University Reactor Infrastructure and Educational Assistance program was designed to address declining enrollment levels among U.S. nuclear engineering programs. Since the late 1990's, enrollment levels in nuclear education programs have tripled. In fact, enrollment levels for 2005 have reached upwards of 1,500 students, the program's target level for the year 2015. In addition, the number of universities offering nuclear-related programs also has increased. These trends reflect renewed interest in nuclear power. Students will continue to be drawn into this course of study, and universities, along with nuclear industry societies and utilities, will continue to invest in university research reactors, students, and faculty members. Consequently, Federal assistance is no longer necessary, and the 2007 budget proposes termination of this program. The termination is also supported by the fact that the program was unable to demonstrate results from its activities when reviewed using the Program Assessment Rating Tool (PART), supporting the decision to spend taxpayer dollars on other priorities. Funding for providing fresh reactor fuel to universities is included in the Research Reactor Infrastructure program, housed within Radiological Facilities Management.

Recognizing the abundance of coal as a domestic energy resource, the Department remains committed to research and development to promote its clean and efficient use. U.S. coal accounts for 25 percent of the world's coal reserves. For the last 3 years, the Department has been working to launch a public-private partnership, FutureGen, to develop a coal-based facility that will produce electricity and hydrogen with essentially zero atmospheric emissions. This budget includes \$54 million in fiscal year 2007 and proposes an advance appropriation of \$203 million for the program in fiscal year 2008. Funding for FutureGen will be derived from rescinding \$203 million in balances no longer needed to complete active projects in the Clean Coal Technology program. Better utilization of these fund balances to support FutureGen will generate real benefits for America's energy security and environmental quality.

The budget request for fiscal year 2007 includes \$4.6 million to support Alaska Natural Gas Pipeline activities authorized by Congress in late 2004. Within the total amount of \$4.6 million, \$2.3 million will be used to support an Office of the Federal Coordinator and the remaining \$2.3 million will support the Loan Guarantee portion of the program. Once constructed, this pipeline will be capable of delivering enough gas to meet about 10 percent of the U.S. daily natural gas needs.

The budget request proposes to terminate the oil and gas research and development programs, which have sufficient market incentives for private industry support, to other energy priorities.

The Energy Policy Act of 2005 established a new mandatory oil and gas research and development (R&D) program, called the Ultra-Deep and Unconventional Natural Gas and Other Petroleum Research program, that is to be funded from Federal revenues from oil and gas leases beginning in fiscal year 2007. These R&D activities are more appropriate for the private-sector oil and gas industry to perform. Therefore, this budget proposes to repeal the program through a future legislative proposal, although we will faithfully execute current law until such time that Congress acts affirmatively on that legislative proposal.

The fiscal year 2007 budget includes \$124.9 million for a refocused portfolio of energy reliability and assurance activities in the Office of Electricity Delivery and Energy Reliability. This will support research and development in areas such as high temperature superconductivity, and simulation work needed to enhance the reliability and effectiveness of the Nation's power supply. This office also operates the Department's energy emergency response capability and led DOE's support effort during and after the Gulf Coast hurricanes.

#### ENSURING A CLEAN ENVIRONMENT

To deliver on the Department's environmental cleanup commitments following 50 years of nuclear research and production from the Cold War, in 2002 the Environmental Management program underwent a major transformation that would enable

the Department to perform its cleanup activities faster than previously estimated. Working in partnership with the public, States and regulators, the Environmental Management (EM) program has made significant progress in the last 4 years to shift away from risk management toward risk reduction. By the end of fiscal year 2006, the cleanup of a total of 86 DOE nuclear legacy sites will be complete. This includes the recently announced completion of Rocky Flats and the anticipated fiscal year 2006 completion of Fernald and Columbus sites in Ohio. While encouraged by the results demonstrated thus far, the program continues to stay focused on the mission and is working aggressively to enhance and refine project management approaches while addressing the regulatory and legal challenges associated with this complex environmental cleanup program.

In fiscal year 2007, the budget includes \$5.8 billion to continue environmental cleanup with a focus on site completion, with eight sites or areas to be completed in the 2007 to 2009 timeframe. This budget request is reduced from the fiscal year 2006 budget request of \$6.5 billion primarily reflecting cleanup completion at some sites in fiscal year 2006 and the subsequent transfer of post-closure work activities. As cleanup work is completed over the next 5 years at sites without a continuing mission, EM will transfer long-term surveillance and monitoring activities and management of pension and benefit programs to the Office of Legacy Management. For those with continuing missions, these activities will be transferred to the cognizant program office.

The \$5.8 billion budget request remains focused on EM's mission of reducing risk by cleaning up sites—consequently also reducing environmental liability—and will support the following key activities:

- Stabilizing radioactive tank waste in preparation for disposition (about 30 percent of the fiscal year 2007 request for EM);
- Dispositioning transuranic and low-level wastes (about 15 percent of the request for EM);
- Storing and safeguarding nuclear materials (about 15 percent of the request for EM);
- Decontaminating and decommissioning excess facilities (about 20 percent of the request for EM); and
- Remediating major areas of our large sites (Hanford, Savannah River Site, Idaho National Laboratory, and Oak Ridge Reservation) (about 10 percent of the request for EM).

One of the significant cleanup challenges is the management and treatment of high-level radioactive liquid waste at the Hanford Waste Treatment and Immobilization Plant (WTP). In fiscal year 2007, \$690 million is proposed for the WTP project. The plant is a critical component of the program's plans to clean up 53 million gallons of radioactive waste currently stored in 177 aging underground storage tanks.

By June 2006, the U.S. Army Corps of Engineers is expected to complete an independent cost validation, deploying more than 25 professionals experienced in cost estimating, design, construction, and commissioning. The Department plans to utilize the results from several reviews to validate cost and schedule for this project.

The Department, while responsible for the cleanup and disposal of high-level radioactive waste generated from the Cold War, is also responsible for managing and disposing of commercial spent nuclear fuel in a safe and environmentally sound manner. The latter responsibility is the mission of DOE's Office of Civilian Radioactive Waste Management (RW).

The Nation's commercial and defense high-level radioactive waste and spent nuclear fuel will be safely isolated in a geologic repository to minimize risk to human health and the environment. The fiscal year 2007 budget requests \$544.5 million to establish a geologic repository at Yucca Mountain, Nevada. This administration is strongly committed to establishing Yucca Mountain as the Nation's first permanent repository for high-level waste and spent nuclear fuel. Licensing and developing a repository for the disposal of these materials will help set the stage for an expansion of nuclear power through the President's GNEP initiative, which could help to diversify our energy supply and support our economic future. Permanent geological disposal at Yucca Mountain offers the safest, most environmentally sound solution for dealing with this challenge.

To further advance the administration's commitment to the establishment of Yucca Mountain, the Department intends to submit to Congress legislation to address land withdrawal, funding and other issues that are important to the program's success.

As the Environmental Management program completes cleanup of sites throughout the DOE complex, management of post closure activities at these sites will transfer to the Office of Legacy Management (LM). In fiscal year 2007, \$201.0 mil-

lion is proposed to provide long-term surveillance and maintenance, long-term response actions, oversight and payment of pensions and benefits for former contractor retirees, and records management activities at closure sites transferred to LM. The majority of funding (\$122.4 million) is associated with the transfer of post closure responsibilities and funding of three major sites from EM to LM in fiscal year 2007. These sites are: Rocky Flats, \$90.8 million; Fernald, \$26.5 million; and a group of sites known as the Nevada off sites, \$5.1 million. The cumulative effect of these three transfers results in a 150 percent increase in the Legacy Management budget matched by a corresponding decrease in the Environmental Management budget.

#### IMPROVING MANAGEMENT AT THE DEPARTMENT OF ENERGY

Underpinning and supporting all of the programs above, the Department of Energy has continued to make strides in meeting President Bush's challenge to become more efficient, more effective, more results-oriented, and more accountable for performance. Over the past 4 years, the President's Management Agenda (PMA) has been the framework for organizing the Department's management reform efforts.

To better manage human capital, the Department implemented a performance management system to link employee achievement at all levels with mission accomplishment. In fiscal year 2006, DOE will publish, communicate and implement a revised 5-year Human Capital Management Strategic Plan as well as a formal leadership succession plan.

In fiscal year 2006 and fiscal year 2007, DOE will expand the availability of financial data in support of decision-making by continuing to implement the Integrated Management Navigation (I-MANAGE) system, specifically in the areas of budget and procurement through the Integrated Data Warehouse (IDW). The Department continues to apply Earned Value Management principles to each of its major information technology investments. In addition, DOE is partnering with other government agencies to develop a standardized and integrated human resources information system, and to develop a consolidated grants management system.

The Department continued its effort to institutionalize multi-year planning and strengthen the link between program performance and resource allocation decisions. The Program Assessment Rating Tool (PART) continues to be used to promote improved program performance. For programs that have not formally been reviewed by OMB, the PART process has been used for internal self-assessment.

A number of important milestones were reached in Real Property Management including the approval of the Asset Management Plan (AMP) by the Deputy Secretary. The AMP outlines an overall framework for the strategic management of the Department's \$77 billion portfolio of Real Property Assets. Additionally, the 20,000 real property records in the Facilities Information Management System, the Department's repository of real property information, were populated and updated as required by the Federal Real Property Council for support of the Federal Real Property Profile. This information will be used to support real property management decisions department-wide.

As these examples indicate, the Department of Energy is using the PMA to address its many management challenges. The Department is working to become more streamlined, more efficient, and more results-oriented in fiscal year 2007 and beyond.

#### CONCLUSION

Energy is central to our economic and national security. Indeed, energy helps drive the global economy and has a significant impact on our quality of life and the health of our people and our environment. The fiscal year 2007 budget request balances the need to address short-term challenges while planning for long-term actions. The request reflects our belief that basic science research should remain strong if we are to remain competitive with our global partners. The request contains bold new initiatives in nuclear, biomass, and solar energy. It continues the President's strong commitment to clean coal, hydrogen, and fusion. The request honors our commitment to deal with civilian nuclear waste, as well as legacy waste from the Cold War, and to further our already successful nonproliferation programs in order to help ensure a safer world for generations to come.

This completes our testimony, and we would be pleased to respond to your questions today or in the future.

Senator DOMENICI. I think you should just right now off the top of your head start answering some of the things we raised. Take another 5 minutes.

## COAL RESEARCH

Mr. GARMAN. All right. Let me first talk about coal, Senator Bond. We are proud of the fact that in this administration from the fiscal year 2002 budget to the present budget we have spent \$2.2 billion on coal research, and we think that is very important. The President had made a promise that he would spend—he would request \$2 billion over 10 years and it did not take him 10 years to fulfill that promise. He fulfilled it in 6, and we are proud of that.

It is true that there is a dramatic decrease proposed in one aspect of that coal research, the Clean Coal Power Initiative, which is a demonstration program, and, as you have noted, it has gone from about \$49 million to \$5 million. The other part of the story is that there is in the neighborhood of \$500 million in unobligated funds sitting in that account, some of those funds dating back from the 1990's.

OMB and our own folks looked at that account balance and asked ourselves the question, are all of those moneys going toward good programmatic activities? Do we need to request more authority now? Might it be possible to take some of those funds, get them into a new solicitation, so that we can continue this work?

We do take the point. We think it is very important to have a demonstration program to test drive these technologies before Wall Street will fund them. We do think that is important. One of the things that Assistant Secretary Jared is looking at, who is sitting behind me now, is looking at what of those funds might be freed up and made available if they are not being productively used and quickly used now. We want to improve that program. We want to get the money moving more quickly and get those dollars in the game.

## LOAN GUARANTEES

On the issue of loan guarantees, Mr. Chairman, which is something that you raised. The Secretary, who has something of a background in financial management, is personally involved in this with us and he is counseling that we take a cautious approach. As you know, the Department of Energy's track record in loan guarantees is mixed at best. We have made loan guarantees on geothermal programs in the past. Four of them failed. We have made three loan guarantees on synthetic fuels. One of them has been successful after default. We have made three loan guarantees in alcohol fuels programs. One of them, again after a default, is paying back against that.

Senator DOMENICI. How old are these programs?

Mr. GARMAN. They are old.

Senator DOMENICI. You bet.

Mr. GARMAN. They are quite old.

So we are batting 2 out of 6—I am sorry, 6 out of 14. So we have zeroed in on the loan guarantee provisions, specifically in title XVII of the Energy Policy Act and other places, as being incredible new tools at our disposal that we do want to employ.

I want to disavow you of this notion that somehow we are stalled. We have created a Loan Guarantee Office, and this is an office that is very important. It is an office that will conduct the

process, qualify lenders, manage proposal reviews, monitor the portfolio of the Department. We are working to seek expertise. There is a lot of expertise that you need, financial expertise, credit risk expertise, commercial viability assessment expertise, that we may or may not have inside the Department. So we are getting that expertise, acquiring it from outside where possible, contracting it if necessary.

We hope to be in a position to accept the first loan guarantee pre-applications for that universe of people who are self-payers under the provisions of the bill some time this summer, with a view that we might be in a position to make a contingent offer later this year. Now, I want to be clear. This is not a promise on our part. This is our internal goal. This is what we are hoping to achieve in the timeframe. Frankly, the Secretary is skeptical that we can pull it off that quickly, but his expectation is that we move as expeditiously as possible and, as you know, Secretary Bodman, is not a man that we relish letting down.

Senator DOMENICI. We are going to move to the soon-to-be Secretary.

Mr. GARMAN. So those are two of the issues.

Senator DOMENICI. But I do want to make a point—

Mr. GARMAN. Yes, sir.

Senator DOMENICI [continuing]. Because I do not think the testimony should be taken of these prior efforts as being efforts that are synonymous with the proposals contained within, for loan guarantees, in the new Policy Act. The new Policy Act provides for a completely different kind of loan guarantee, as you well know.

Mr. GARMAN. Yes, sir.

Senator DOMENICI. That loan guarantee is at zero cost to the government because the applicant pays for the costs. There is a significant cleansing mechanism for whether it is a good project or not because of that, and it will be a different kind of proposal.

What I am hearing you say is you are not slowing up on putting together all the apparatus, the structure needed. That is moving ahead as quickly as you can?

Mr. GARMAN. Correct. For instance, we are trying to use guidelines, as opposed to regulations, because a regulatory process would take another 18 months or longer, and that is something that we are working with the Office of Management and Budget to understand how we can move ahead in that realm.

Senator DOMENICI. We are now going to ask Dr. Orbach to give his testimony. You can do it however you would like. Your statement is in the record at this point without objection. Proceed.

#### OFFICE OF SCIENCE

#### STATEMENT OF RAYMOND L. ORBACH, Ph.D., DIRECTOR

Dr. ORBACH. Thank you, Mr. Chairman, members of the committee. I appreciate the opportunity to testify today and I appreciate the support that this committee has provided for science and its relationship to our Nation's energy security and economic competitiveness.

The fiscal year 2007 President's request, as you have noted, includes a \$505 million increase in the Department of Energy science

program, and the President has announced his commitment to double the funding for basic research in the physical sciences over the next 10 years. We are going to use the increase in funding this year, with roughly half going to operations of our large-scale facilities and the other half to research, to competitively based research proposals from the entire community, to restore the balance between our facilities and our operations and our basic research program.

The instruments that we are building we believe will give the United States an order of magnitude dominance over all other facilities in the areas that we approach. We will be a full partner in ITER, contained in this budget. We will be placing on the floor three high-end computational structures for a variety of physical problems, the fastest in the non-defense world.

We will be continuing with construction of the world's first free electron X-ray laser. This machine will provide ten orders of magnitude dominance over any other hard X-ray source in the world today. More than that, its timing will enable us to observe the change in the electron clouds as chemical reactions take place and to determine the structure of individual macromolecules.

The Spallation Neutron Source will turn on in June of this year, a \$1.4 billion project which is on time and on budget, and gives us an order of magnitude dominance for neutron scattering, pulse neutron scattering, in the world.

Four of our five nanocenters will start operations with the 2007 budget. These nanocenters will be unmatched anywhere in the world and will give our scientists and engineers opportunities to construct at the atomic level and understand the properties of the materials as they are being grown.

We will be contributing \$60 million to R&D for the International Linear Collider, which we hope will restore American dominance in high-energy physics in the next decade. We will be increasing the power of the CEBAF, the Continuous Electron Beam Accelerator Facility, at Thomas Jefferson to 12 GEV, which will enable us to see the structure of individual quarks and gluons in the nucleus.

We will be contributing to the optimum operations of RHIC at Brookhaven to study the properties of the universe very close to its creation. Finally, we will be finishing our R&D and investing in project engineering design for the NSLS-2, which is the first of the fourth generation light sources. This will be an X-ray microscope capable of operating at one nanometer in size, which would be of the order of three atomic diameters. There is no other instrument like it in the world. In addition, it will have an energy resolution that will give us not only the structure but also the dynamics of these new materials as they are created.

I have gone through this to give you a sense of the impact that this augmentation in the Office of Science budget will have. We are fully aware that this request takes place in a period of budgetary stringency. We are indebted to the President for his foresight in recognizing the vital importance of America's continued leadership in the physical sciences to our Nation's global competitive position and our quest for greater energy security.

We are committed to upholding our part of the bargain by delivering truly transformational science and technologies, break-

through advances that will provide new pathways to energy security and ensure America's continued global economic leadership in the years ahead.

PREPARED STATEMENT

Mr. Chairman, I am pleased to discuss this budget with you today. I thank you and the committee for the opportunity to appear and for your support over the years for the science program. Thank you.

[The statement follows:]

PREPARED STATEMENT OF DR. RAYMOND L. ORBACH

Mr. Chairman and members of the subcommittee, thank you for the opportunity to testify today on the Office of Science's fiscal year 2007 budget request. I appreciate your strong support for basic research in the physical sciences, Mr. Chairman, and your understanding of the importance of this research to our Nation's energy security and economic competitiveness. I also want to thank the members of the subcommittee for their support. This budget represents a strong commitment on the part of the President to ensure continued U.S. leadership in the basic sciences. I believe this budget will enable the Office of Science to strengthen U.S. scientific leadership and carry out its mission to deliver the revolutionary discoveries and scientific tools that transform our understanding of energy and matter and advance our national, economic and energy security.

The Office of Science requests \$4,101,710,000 for the fiscal year 2007 Science appropriation, an increase of \$505,319,000 over the fiscal year 2006 appropriation. As part of the President's American Competitiveness Initiative, the fiscal year 2007 budget represents the beginning of the President's commitment to double, over 10 years, the sum of the research investment at the Office of Science, the National Science Foundation, and the Department of Commerce's National Institute of Standards and Technology. This commitment will help ensure that the United States remains the world leader in critical areas of basic scientific research; maintains an order of magnitude dominance for large-scale scientific facilities and instrumentation in the key fields of science and technology that will drive the 21st century economy; pursues the transformational technologies necessary for greater energy security and independence for our Nation; and nurtures and develops a world-class scientific and engineering workforce.

The Office of Science is the lead Federal supporter for basic research in the physical sciences in the United States, and the steward for fields such as systems biology for energy and the environment, materials science, high energy physics, nuclear physics, heavy element chemistry, plasma physics, magnetic fusion, and catalysis. It also supports unique and vital components of U.S. research in climate change and geophysics. Researchers funded through the Office of Science are working on some of the most pressing scientific challenges of our age including: (1) Harnessing the power of microbial communities for: energy production from renewable sources, carbon sequestration, and environmental remediation; (2) Expanding the frontiers of nanotechnology to develop materials with unprecedented properties for widespread potential scientific, energy, and industrial applications; (3) Pursuing the breakthroughs in materials science, nanotechnology, biotechnology, and other fields needed to make solar energy more cost-effective; (4) Demonstrating the scientific and technological feasibility of creating and controlling a sustained burning plasma to generate energy, as the next step toward making fusion power a commercial reality; (5) Using advanced computation, simulation, and modeling to understand and predict the behavior of complex systems, beyond the reach of our most powerful experimental probes, with transformational impact on a broad range of scientific and technological undertakings; (6) Understanding the origin of the universe and nature of dark matter and dark energy; and (7) Resolving key uncertainties and expanding the scientific foundation needed to understand, predict, and assess the potential effects of atmospheric carbon on climate and the environment.

U.S. preeminence in science, technology, and innovation will depend on the continued availability of the most advanced scientific research facilities for our researchers. The Office of Science builds and operates the world's most powerful array of scientific facilities and instruments, including advanced synchrotron light sources, the new Spallation Neutron Source, state-of-the-art Nanoscale Science Research Centers, genome sequencing facilities, supercomputers and high-speed networks, cli-

mate and environmental monitoring capabilities, and particle accelerators for high energy and nuclear physics. We are in the process of developing an X-ray free electron laser light source that can image single large macromolecules and measure in real-time changes in the chemical bond as chemical and biological reactions take place. Our premier tools of science at the 10 national laboratories managed by the Office of Science are used by over 19,000 researchers and students from universities, other Federal agencies, and private industry every year, and have enabled U.S. researchers to make some of the most important scientific discoveries of the past 70 years.

Office of Science leadership in basic research in the physical sciences, and stewardship of large research facilities, is directly linked to its role in training America's scientists, engineers, and teachers. Through the funding of a diverse portfolio of research at more than 300 colleges and universities nationwide, we provide direct support and access to research facilities for thousands of university students and researchers in the physical and biological sciences and mathematics. Facilities at the national laboratories provide unique opportunities for researchers and their students from across the country to pursue questions at the intersection of physics, chemistry, biology, computing, and materials science. The Office of Science also sponsors undergraduate student internships and fellowships for science and mathematics K-12 teachers for research experience and training at the national laboratories.

The fiscal year 2007 budget request will allow the Office of Science to increase support for high-priority DOE mission-driven scientific research as well as support new initiatives; maintain optimum operations at our scientific user facilities; keep major facility construction projects on schedule and within budget; and treble educational, research, and training opportunities for the next generation of scientists, engineers, and teachers. The budget will also allow us to expand our contribution to basic research in support of the President's Hydrogen Fuel Initiative and the President's new Advanced Energy Initiative. Roughly half of our budget goes to construction and operations of the large scientific facilities, and the other half is approximately equally split between research at the DOE laboratories and research at universities. This budget will support the research of approximately 24,200 faculty, students, and postdoctoral researchers throughout the Nation, an increase of 2,600 from fiscal year 2006.

The following programs are supported in the fiscal year 2007 budget request: Basic Energy Sciences, Advanced Scientific Computing Research, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics, Nuclear Physics, Science Laboratories Infrastructure, Science Program Direction, Workforce Development for Teachers and Scientists, and Safeguards and Security.

#### OFFICE OF SCIENCE FISCAL YEAR 2007 PRESIDENT'S REQUEST SUMMARY BY PROGRAM

[In thousands of dollars]

	Fiscal Year 2005 Appropriation	Fiscal Year 2006 Appropriation	Fiscal Year 2007 Request
Science:			
Basic Energy Sciences .....	1,083,616	1,134,557	1,420,980
Advanced Scientific Computing Research .....	226,180	234,684	318,654
Biological and Environmental Research:			
Base program .....	487,474	451,131	510,263
Congressionally directed projects .....	79,123	128,700	.....
Total, Biological and Environmental Research .....	566,597	579,831	510,263
High Energy Physics .....	722,906	716,694	775,099
Nuclear Physics .....	394,549	367,034	454,060
Fusion Energy Sciences .....	266,947	287,644	318,950
Science Laboratories Infrastructure .....	37,498	41,684	50,888
Workforce Development for Teachers and Scientists .....	7,599	7,120	10,952
Science Program Direction .....	154,031	159,118	170,877
Safeguards and Security .....	67,168	68,025	70,987
Small Business Innovation Research/Small Business Technology Transfer .....	113,621	.....	.....
Subtotal, Science .....	3,640,712	3,596,391	4,101,710
Less use of prior year balances .....	-5,062	.....	.....

OFFICE OF SCIENCE FISCAL YEAR 2007 PRESIDENT'S REQUEST SUMMARY BY PROGRAM—  
Continued  
[In thousands of dollars]

	Fiscal Year 2005 Appropriation	Fiscal Year 2006 Appropriation	Fiscal Year 2007 Request
Total, Science .....	3,635,650	3,596,391	4,101,710

FISCAL YEAR 2007 SCIENCE PRIORITIES

In his State of the Union Message on January 31, 2006, President George W. Bush stated,

“To keep America competitive, one commitment is necessary above all: We must continue to lead the world in human talent and creativity. Our greatest advantage in the world has always been our educated, hardworking, ambitious people—and we’re going to keep that edge. Tonight I announce an American Competitiveness Initiative, to encourage innovation throughout our economy, and to give our Nation’s children a firm grounding in math and science.

“First, I propose to double the Federal commitment to the most critical basic research programs in the physical sciences over the next 10 years. This funding will support the work of America’s most creative minds as they explore promising areas such as nanotechnology, supercomputing, and alternative energy sources.”

I believe the American Competitiveness Initiative and this commitment by the President present an historic opportunity for science in our country and continued U.S. global competitiveness. Through the fiscal year 2007 budget, the Office of Science will build on our record of results with new investments to maintain U.S. world-leadership status in the physical sciences, keep U.S. research and development at the forefront of global science, and increase America’s talent pool in science, technology, engineering, and mathematics.

Determining science and technology priorities across the Office of Science programs is an ongoing process, both in times of budget stringency and budget increases. Several factors are considered in our prioritization, including scientific opportunities identified by our scientific advisory committees and the overall scientific community; DOE mission needs; and administration and Departmental priorities. In fiscal year 2007, we will support the priorities in scientific research, facility operations, and construction and laboratory infrastructure established in the past few years and outlined in the Office of Science Strategic Plan and 20-year Facilities Outlook, in addition to Presidential and Departmental initiatives.

The President’s Hydrogen Fuel Initiative and the new Advanced Energy Initiative will be supported through our contributions to basic research in hydrogen, fusion, solar energy to transportation fuels, chemical separation and materials for advanced nuclear energy systems, and production of ethanol from cellulose. We will also continue strong support for other administration priorities such as nanotechnology, advanced scientific computation, and climate change science and technology.

The Office of Science will actively lead and support the U.S. contributions to ITER, the international project to build and operate the first fusion science facility capable of producing a sustained, burning plasma to generate energy on a massive scale without environmental insult.

Full operations at four of the DOE Nanoscale Science Research Centers (NSRCs) and completion of construction and start-up operations for the fifth NSRC will be supported in fiscal year 2007. These facilities are the Nation’s premier nanoscience user centers, providing resources unmatched anywhere in the world for the synthesis, fabrication, and analysis of nanoparticles and nanomaterials.

We will fully fund the programs in advanced scientific computing including support for: increasing capacity to 100–150 teraflops (trillions of operations per second) for high-performance production computing at the National Energy Research Scientific Computing Center (NERSC); 250 teraflop capability for modeling and simulation of scientific problems in combustion, fusion, and complex chemical reactions at Oak Ridge National Laboratory’s Leadership Computing Facility; and installation of a 100 teraflop peak capacity IBM Blue Gene P system at Argonne National Laboratory’s Leadership Computing Facility to extend architectural diversity in leadership computing and address challenges in catalysis, protein/DNA complexes, and materials sciences related to next-generation design of nuclear reactors.

The Office of Science designs, constructs, and operates facilities and instruments that give U.S. scientists an “order of magnitude” lead over foreign competition in key scientific fields. For example, increasing the computing capacity at NERSC and

the Leadership Computing Facilities will give the United States computational capabilities for open scientific research that are at least 10 times greater than available anywhere else. The Linac Coherent Light Source (LCLS) at the Stanford Linear Accelerator Center, when it comes on line in 2009, will produce X-rays 10 billion times, or 10 orders of magnitude more intense than any existing X-ray source in the world, and allow structural studies on individual nanoscale particles and single biomolecules. The Spallation Neutron Source (SNS), the world's forefront neutron scattering facility, will increase the number of neutrons available for cutting-edge research by a factor of 10 over any existing Spallation neutron source in the world when operations begin this year. We will be supporting the first full year of SNS operations in fiscal year 2007 as well as the fabrication of four to five instruments that are part of the initial suite of instruments for the target station.

In fiscal year 2007, we will begin R&D and project engineering and design for the next generation of synchrotron light sources. The National Synchrotron Light Source-II (NSLS-II) will deliver orders of magnitude improvement in spatial resolution, providing the world's finest capabilities for X-ray imaging and enabling the study of material properties and functions, particularly at the nanoscale, at a level of detail and precision never before possible. Its energy resolution will explore dynamical properties of matter as no other light source has ever accomplished.

Our research programs in nuclear physics continue to receive strong support. We will continue optimum operations at the Relativistic Heavy Ion Collider (RHIC), and support additional instrumentation projects for RHIC for studying the properties of hot, dense nuclear matter, providing insight into the early universe. We will also support increased operations at the Continuous Electron Beam Accelerator Facility (CEBAF) and project engineering and design for doubling the energy of the existing beam at CEBAF to 12 gigaelectron volts. It will image directly individual quarks and gluons in the nucleus, something never before accomplished.

In addition to supporting core experimental and theoretical high-energy physics research, we will double the resources for R&D for the proposed high-energy, high luminosity electron-positron International Linear Collider. And we will maintain strong support for U.S. participation in the research program at the Large Hadron Collider, scheduled to begin operations in 2007.

The Office of Science will expand the Genomics: GTL program—a program that builds on the advances in genome sequencing, molecular science, and computation, to understand and ultimately harness the functions of microbes to address DOE's mission needs.

We will also continue to support the development of leaders in the science and mathematics education community through a tripling of the number of K–12 teachers participating in the Laboratory Science Teacher Professional Development program, focusing on middle school teachers and students. This immersion program, working with master teachers and laboratory mentor scientists, builds content knowledge, research skills, and a lasting connection to the scientific community, leading to more effective teaching that inspires students in science and mathematics.

#### SCIENCE ACCOMPLISHMENTS

Over the past 50 years, the Office of Science has blended cutting-edge research and innovative problem solving to keep the United States at the forefront of scientific discovery. American taxpayers have received great value for their investment in basic research sponsored by the Office of Science that has led to significant technological innovations, new intellectual capital, enhanced economic competitiveness, and improved quality of life. The following are some of the past year's highlights:

*Promoting the Contributions of Physics to Our Quality of Life—2005 World Year of Physics.*—The Office of Science, in coordination with researchers at universities nationwide and the DOE national laboratories, celebrated the 2005 World Year of Physics through a year-long program of activities and materials highlighting how physics enables advances in science and contributes to the quality of life. In celebration of the centennial of Albert Einstein's "miracle year", 1905, when he published four papers that laid the foundations of much of physics as we know it today, the Office of Science co-sponsored a new PBS NOVA program, "Einstein's Big Idea", and its associated educational materials. The program aired on PBS stations nationwide in October 2005. Library guides about the program were distributed to all 16,000 libraries nationwide, and teacher's guides were sent nationwide to 15,000 high school physics teachers, 3,700 middle school physics teachers, and 400 middle school science chairs. Several of the national laboratories held special lectures, symposia, and education events for local middle school and high school students and the surrounding communities. A DOE/Office of Science website was created to educate the

public about the significance of Einstein's revolutionary work, describe the role of physics in various science and technology fields, publicize events, and highlight the work of DOE-sponsored physicists. The "DOE Physicists at Work" website continues to profile the work of young physicists conducting research in the universities and national laboratories funded by the Office of Science. Several activities coordinated by the American Physical Society were also co-sponsored by the Office of Science including Physics Quest, an outreach event held on the grounds of the Institute for Advanced Studies in Princeton, NJ, that took over 100,000 middle school students through a series of experiments on a hunt to finding Einstein's "missing treasure", and Physics on the Road, a project that supported the materials and equipment for teams from colleges and universities to perform physics demonstrations at schools and public venues.

*Nobel Prize in Chemistry.*—The 2005 Nobel prize in chemistry was awarded to Robert H. Grubbs (CalTech), Richard R. Schrock (MIT), and Yves Chauvin (French Petroleum Institute) for the development of the "metathesis method" in organic synthesis. This method of selectively stripping out certain atoms in a compound and replacing them with atoms that were previously part of another compound employs novel catalysts to simplify the process of custom-building molecules with specialized properties. Metathesis has led to industrial and pharmaceutical methods that are more efficient, produce fewer by-products, and are more environmentally friendly. The work of the laureates has major significance in the production of fuels, synthetic fibers, plastics, and pharmaceuticals. The Office of Science has supported Dr. Schrock's work in catalytic chemistry at the Massachusetts Institute of Technology since 1979 and supported Dr. Grubbs' work in homogeneous catalysis at Caltech from 1979 through 1988.

*Discoveries and Capabilities at the Frontier of Nanoscale Science.*—In 2005, the world's first hard X-ray nanoprobe beamline was activated at the Advanced Photon Source (Argonne). The X-ray microscope nanoprobe will provide spatial resolution of 30 nanometers or better, making it a valuable tool for studying nanomaterials as the new Center for Nanoscale Materials begins operations in 2006 at Argonne National Laboratory. Researchers at the Stanford Synchrotron Radiation Laboratory have developed new methods for studying the structure of nanomaterials through a combined use of X-ray scattering and absorption measurement techniques that has led to significant advances in understanding the structures of nanomaterials and routine characterization of bacterial nano-minerals. Scientific discoveries at the nanoscale in 2005 include the following: ultrathin films, six atoms thick, that retained ferroelectric properties needed for next generation nanoscale devices such as electronics and sensors; ultrafast laser techniques observed the fastest reversible phase transition between nanocrystal structures ever recorded with the transition of vanadium oxide crystals switching from a semiconducting to metallic phase material; the fabrication of novel semiconductor nanocrystal polymer solar cells that demonstrated surprisingly high efficiencies; and the development of the world's smallest synthetic nanomotor—a 300 nanometer gold rotor on a carbon nanotube shaft—demonstrating advances in the miniaturization of electromagnetic devices.

*Delivering Forefront Computational and Networking Capabilities for Science.*—Several computational sciences and networking advances made in 2005 enable more effective use of leadership-scale computing resources and management of the growing data volumes from the scientific user facilities: computer science researchers have significantly enhanced the performance of simulation models for fusion, atmospheric science, and quantum chemistry applications and continue to improve programming models that optimize complex scientific applications run on computers with hundreds to thousands of processors; researchers at Argonne National Laboratory have produced a new modeling and solution paradigm for the design of efficient electricity markets; the Energy Sciences Network completed the first metropolitan area network connecting six DOE sites in the San Francisco Bay Area with dual connectivity at 20 gigabits per second, 10 to 50 times the previous bandwidth at each site, also improving reliability and lowering costs; and the UltraScienceNet Testbed completed deployment in August 2005 of its 20 gigabit per second reconfigurable optical network testbed designed to test advanced optical network technologies such as advanced data transfer networking technologies designed to meet the increasing demand for bandwidth and the needs of next-generation scientific instruments.

*Advances in Biotechnology for Energy and the Environment.*—Progress towards understanding how living organisms interact with and respond to their environment, and how those processes involved can be utilized, was gained through the following accomplishments: researchers applied both genomic and proteomic approaches to characterize a naturally occurring microbial community for the first time at a remediation site, producing insights into potential biotechnology strategies

for remediation of toxic materials; advanced genomic sequencing technologies applied to samples taken from the Sargasso Sea led to the discovery of over a million new genes that had never been seen before, identifying the potential of environmental genomics for discovering new microbe functionalities that can be harnessed for energy or environmental applications; researchers have developed the ability to insert fiber-optic probes into living cells to watch cellular processes unfold in real time; and a new clearinghouse was established that contains approximately 300 draft or completed genome sequences of microbes, associated information about the gene, protein functions, and biochemical pathways, and browsing tools to help researchers sort through and analyze genomic data.

*Accomplishments in Theory, Simulation, and Experiments Energize Fusion Research Towards ITER.*—With progress on the international agreement to build ITER, investigations on the theory, simulation, and experimentation related to burning plasma and ITER related issues increased in 2005. The results of some of those studies include the following: researchers achieved ITER level plasma pressure at the Alcator C-Mod facility, a world record absolute pressure for magnetic confinement experiments; separate experiments on DIII-D indicated higher plasma pressures can be obtained without a penalty to energy confinement, suggesting that ITER could achieve higher fusion power output than originally conceived; multi-teraflop performance was achieved on a leading plasma micro-turbulence simulation code, demonstrating the ability of the code to effectively utilize increased computational capabilities and accelerate the pace of discoveries in this area of fusion plasma research; and high-performance reduced-activation steels tested under fusion-relevant conditions demonstrated superior performance under intense neutron radiation compared to conventional steels, making these materials lead candidates for structural components of ITER.

#### PROGRAM OBJECTIVES AND PERFORMANCE

The path from basic research to industrial competitiveness is not always obvious. History has taught us that seeking answers to fundamental questions results in a diverse array of practical applications as well as some remarkable revolutionary advances. Working with the scientific community, the Office of Science invests in the most promising research and sets definite and challenging long-term scientific goals with meaningful annual targets. The intent and impact of our performance goals may not always be clear to those outside the research community. Therefore the Office of Science has created a website ([www.sc.doe.gov/measures](http://www.sc.doe.gov/measures)) to better communicate what we are measuring and why it is important. This website also tracks progress toward management improvements and describes a wide array of program accomplishments.

#### ORGANIZATION

The OneSC Project was initiated to streamline the Office of Science structure and improve operations across the Office of Science complex in keeping with the principles of the President's Management Agenda to manage government programs more efficiently and effectively. The Office of Science has been officially reorganized under the OneSC structure (Figure 2). Phase 1 of the reorganization was effective March 20, 2005. Phase 2 of OneSC involves human capital and organizational needs analyses and reengineering of SC business and management operations and processes. The Office of Science business practices and processes will be optimized to remove unnecessary work and support enhanced stewardship and oversight of the Office of Science laboratories. Attrition, retraining, reassignments, and workforce management incentives will be utilized to manage changes in staffing levels or skill mix needs resulting from Phase 2 activities. No downgrades, involuntary geographical transfers, separations, or reductions-in-force are planned or expected.

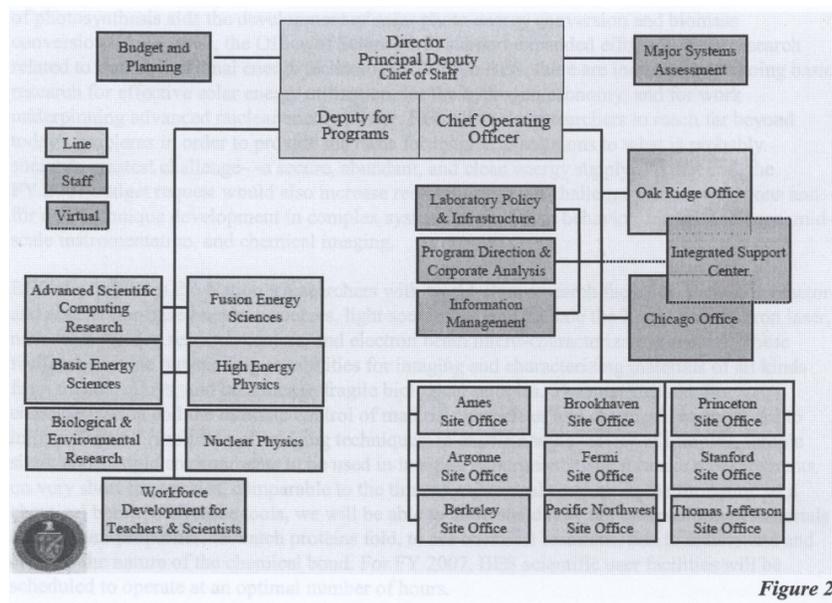


Figure 2

## SCIENCE PROGRAMS

*Basic Energy Sciences*

*Fiscal Year 2006 Appropriation—\$1,134.6 Million; Fiscal Year 2007 Request—\$1,421.0 Million*

Basic research supported by the Basic Energy Sciences (BES) program touches virtually every aspect of energy resources, production, conversion, efficiency, and waste mitigation. Research in materials sciences and engineering leads to the development of materials that improve the efficiency, economy, environmental acceptability, and safety of energy generation, conversion, transmission, and use. Research in chemistry leads to the development of advances such as efficient combustion systems with reduced emissions of pollutants; new solar photo conversion processes; improved catalysts for the production of fuels and chemicals; and better separations and analytical methods for applications in energy processes, environmental remediation, and waste management. Research in geosciences contributes to the solution of problems in multiple DOE mission areas, including reactive fluid flow studies to understand contaminant remediation and seismic imaging for reservoir definition. Research in the molecular and biochemical nature of photosynthesis aids the development of solar photo energy conversion and biomass conversion. In fiscal year 2007, the Office of Science will support expanded efforts in basic research related to transformational energy technologies. Within BES, there are increases to ongoing basic research for effective solar energy utilization, for the hydrogen economy, and for work underpinning advanced nuclear energy power. BES also asks researchers to reach far beyond today's problems in order to provide the basis for long-term solutions to what is probably society's greatest challenge—a secure, abundant, and clean energy supply. To that end, the fiscal year 2007 budget request would also increase research for grand challenge science questions and for new technique development in complex systems or emergent behavior, ultrafast science, mid-scale instrumentation, and chemical imaging.

BES also provides the Nation's researchers with world-class research facilities, including reactor- and accelerator-based neutron sources, light sources soon to include the X-ray free electron laser, nanoscale science research centers, and electron beam micro-characterization centers. These facilities provide outstanding capabilities for imaging and characterizing materials of all kinds from metals, alloys, and ceramics to fragile biological samples. The next steps in the characterization and the ultimate control of materials properties and chemical reactivity are to improve spatial resolution of imaging techniques; to enable a wide variety of samples, sample sizes, and

sample environments to be used in imaging experiments; and to make measurements on very short time scales, comparable to the time of a chemical reaction or the formation of a chemical bond. With these tools, we will be able to understand how the composition of materials affects their properties, to watch proteins fold, to see chemical reactions, and to understand and observe the nature of the chemical bond. For fiscal year 2007, BES scientific user facilities will be scheduled to operate at an optimal number of hours.

Construction of the Spallation Neutron Source (SNS) will be completed during the 3rd quarter of fiscal year 2006 and will join the suite of BES scientific user facilities. In fiscal year 2007, BES will support continued fabrication and commissioning of SNS instruments, funded both as part of the SNS project and from other sources including non-DOE sources, and will increase power to full levels. A new Major Item of Equipment is funded in fiscal year 2007 that will allow the fabrication of approximately four to five additional instruments for the SNS, thus nearly completing the initial suite of 24 instruments that can be accommodated in the high-power target station.

Four Nanoscale Science Research Centers will be fully operational in fiscal year 2007: the Center for Nanophase Materials Sciences at Oak Ridge National Laboratory, the Molecular Foundry at Lawrence Berkeley National Laboratory, the Center for Nanoscale Materials at Argonne National Laboratory, and the Center for Integrated Nanotechnologies at Sandia National Laboratories and Los Alamos National Laboratory. A fifth Center, the Center for Functional Nanomaterials at Brookhaven National Laboratory, will receive final year construction funding. In fiscal year 2007, there are significant shifts in the nanoscale science and engineering research activities contributing to the BES investments in research at the nanoscale and a substantial overall increase in funding. Overall, the total investment for these Nanoscale Science Research Centers decreases by about 10 percent owing to the planned decrease in construction funding. Funding for research at the nanoscale increases very significantly owing to increases in funding for activities related to the hydrogen economy, solar energy conversion, and advanced nuclear energy.

The Linac Coherent Light Source (LCLS) at the Stanford Linear Accelerator Center (SLAC) will continue Project Engineering Design (PED) and construction at the planned levels. The purpose of the LCLS Project is to provide laser-like radiation in the X-ray region of the spectrum that is 10 billion times greater in peak power and peak brightness than any existing coherent X-ray light source and that has pulse lengths measured in femtoseconds—the timescale of electronic and atomic motions. The LCLS will be the first facility in the world for such groundbreaking research in the physical and life sciences. Support is also provided for PED and R&D for the National Synchrotron Light Source-II (NSLS-II), which will be a new synchrotron light source, highly optimized to deliver ultra-high brightness and flux and exceptional beam stability. This would enable the study of material properties and functions with a spatial resolution of 1 nanometer (nm), an energy resolution of 0.1 millielectron volt (meV), and the ultra-high sensitivity required to perform spectroscopy on a single atom. NSLS-II will be transformational in opening new regimes of scientific discovery and investigation. The ability to probe materials with 1 nm or better spatial resolution and to analyze their dynamics with 0.1 meV energy resolution will be truly revolutionary.

The Scientific Discovery through Advanced Computing (SciDAC) program is a set of coordinated investments across all Office of Science mission areas with the goal of achieving breakthrough scientific advances via computer simulation that were impossible using theoretical or laboratory studies alone. The SciDAC program in BES consists of two major activities: (1) characterizing chemically reacting flows as exemplified by combustion and (2) achieving scalability in the first-principles calculation of molecular properties, including chemical reaction rates.

#### *Advanced Scientific Computing Research*

*Fiscal Year 2006 Appropriation—\$234.7 Million; Fiscal Year 2007 Request—\$318.6 Million*

The Advanced Scientific Computing Research (ASCR) program is expanding the capability of world-class scientific research capacity through advances in mathematics, high performance computing and advanced networks, and through the application of computers capable of many trillions of operations per second (terascal computers) to advanced scientific applications. Computer-based simulation enables us to understand and predict the behavior of complex systems that are beyond the reach of our most powerful experimental probes or our most sophisticated theories. Computational modeling has greatly advanced our understanding of fundamental processes of Nature, such as fluid flow and turbulence or molecular structure and reactivity. Soon, through modeling and simulation, we will be able to explore the

interior of stars to understand how the chemical elements were created and learn how protein machines work inside living cells to enable the design of microbes that address critical energy or waste cleanup needs. We could also design novel catalysts and high-efficiency engines that expand our economy, lower pollution, and reduce our dependence on foreign oil. Computational science is increasingly important to progress at the frontiers of almost every scientific discipline and to our most challenging feats of engineering. The science of the future demands that we advance beyond our current computational abilities.

For the past two decades SC, and the worldwide scientific community, have been harvesting their success in building and developing the Internet. This has enabled roughly a doubling in bandwidth every 2 years with no increase in cost. However, the demands of today's facilities, which generate millions of gigabytes per year of data, now outstrip the capabilities of the Internet design and the algorithms, software tools, libraries, and environments needed to accelerate scientific discovery through modeling and simulation are beyond the realm of commercial interest. However, the evolution of the telecom market, including the availability of direct access to optical fiber at attractive prices and the availability of flexible dense wave division multiplexing (DWDM) products gives SC the possibility of exploiting these technologies to provide scientific data where it is needed at speeds commensurate with the new data volumes. However, to take advantage of this opportunity significant research is needed to integrate these capabilities, make them available to scientists, and build the infrastructure which can provide cybersecurity in this environment.

The Mathematical, Information, and Computational Sciences (MICS) effort supports the core research of the ASCR program. To establish and maintain networking, modeling and simulation leadership in scientific areas that are important to DOE's mission, the MICS subprogram employs a broad, but integrated, research strategy. The MICS subprogram's basic research portfolio in applied mathematics and computer science provides the foundation for enabling research activities, which include efforts to advance networking and to develop software tools, libraries, and environments. Results from enabling research supported by the MICS subprogram are used by computational scientists supported by other SC and DOE programs. This link to other DOE programs provides a tangible assessment of the value of the MICS subprogram for advancing scientific discovery and technology development through simulations. In addition to its research activities, the MICS subprogram plans, develops, and operates supercomputer and network facilities that are available—24 hours a day, 365 days a year—to researchers working on problems relevant to DOE's scientific missions. In fiscal year 2007, the Energy Science Network (ESnet) will deliver a backbone network with two to four times the capability of today's network, to support the science mission of the Department. In addition, the National Energy Research Scientific Computing Center (NERSC) will be upgraded in fiscal year 2006 to add a NERSC-5 machine with 100–150 teraflops of peak computing capacity early in fiscal year 2007. The NERSC computational resources are integrated by a common high performance file storage system that enables users to easily use all machines. Therefore the new machine will significantly reduce the current oversubscription at NERSC which serves nearly 2,000 scientists annually.

The Oak Ridge National Laboratory (ORNL) Leadership Computing Facility (LCF), selected under the Leadership Computing Competition in fiscal year 2004, will be enhanced to deliver 250 teraflops of peak capability in fiscal year 2007 for scientific applications. In addition, further diversity with the LCF resources will be realized with an acquisition by Argonne National Laboratory (ANL) of a high performance IBM Blue Gene P with low-electrical power requirements and a peak capability of up to 100 teraflops. The expansion of the Leadership Computing Facility to include the Blue Gene computer at ANL was an important element of the joint ORNL, ANL, and PNNL proposal selected in 2004 to enable solutions for scientific problems beyond what would be attainable through a continued simple extrapolation of current computational capabilities. The capability provided in fiscal year 2007 will accelerate scientific understanding in many areas of science important to DOE including materials science, biology, and advanced designs of nuclear reactors.

The research focus of ASCR SciDAC activities includes Integrated Software Infrastructure Centers (ISICs). ISICs are partnerships between DOE national laboratories and universities focused on research, development, and deployment of software to accelerate the development of SciDAC application codes. Progress to date includes significant improvements in performance modeling and analysis capabilities that have led to doubling the performance on 64 processors of the Community Atmosphere Model component of the SciDAC climate modeling activity. In fiscal year 2006, ASCR is recomputing its SciDAC portfolio, with the exception of activities in partnership with the Office of Fusion Energy that were initiated in fiscal year 2005. In addition, in fiscal year 2007 ASCR will continue the competitively selected

SciDAC institutes which can become centers of excellence in high end computational science in areas that are critical to DOE missions.

Advancing high performance computing and computation is a highly coordinated interagency effort. ASCR has extensive partnerships with other Federal agencies and the National Nuclear Security Administration (NNSA). The activities funded by the MICS subprogram are coordinated with other Federal efforts through the NITR&D subcommittee of the National Science and Technology Council and its Technology Committee. The subcommittee coordinates planning, budgeting, and assessment activities of the multiagency NITR&D enterprise. DOE has been an active participant in these coordination groups and committees since their inception. The MICS subprogram will continue to coordinate its activities through these mechanisms and will lead the development of new coordinating mechanisms as needs arise. The DOE program solves mission critical problems in scientific computing. In addition, results from the DOE program benefit the Nation's information technology basic research effort. The fiscal year 2007 program positions DOE to make additional contributions to this effort.

*Biological and Environmental Research*

*Fiscal Year 2006 Appropriation—\$451.1 Million<sup>1</sup>; Fiscal Year 2007 Request—\$510.3 Million*

Biological and Environmental Research (BER) supports basic research with broad impacts on our health, our environment, and our energy future. Biotechnology solutions are possible for DOE energy and environmental challenges by understanding complex biological systems and developing computational tools to model and predict their behavior. An ability to predict long-range and regional climate enables effective planning for future needs in energy, agriculture, and land and water use. Understanding the global carbon cycle and the associated role and capabilities of microbes and plants can lead to solutions for reducing carbon dioxide concentrations in the atmosphere. Understanding the complex role of biology, geochemistry, and hydrology beneath the Earth's surface will lead to improved decision making and solutions for contaminated DOE weapons sites. Both normal and abnormal health—from normal human development to cancer to brain function—can be understood and improved using radiotracers, advanced imaging instruments, and novel biomedical devices. Understanding the biological effects of low doses of radiation can lead to the development of science-based health risk policy to better protect workers and citizens.

The fiscal year 2007 budget includes funds for the continued expansion of the Genomics: GTL program—a program at the forefront of the biological revolution. This program employs a systems approach to biology at the interface of the biological, physical, and computational sciences to address DOE's mission needs. This research will continue to more fully characterize the inventory of multi-protein molecular machines found in selected DOE-relevant microbes and higher organisms. It will determine the diverse biochemical capabilities of microbes and microbial communities, especially as they relate to potential biological solutions to DOE needs, found in populations of microbes isolated from DOE-relevant sites. Within the Genomics: GTL program, BER will develop the understanding needed to advance biotechnology-based strategies for biofuel production, focusing on biohydrogen and bioethanol.

Ethanol produced from corn starch is currently the most widely consumed biofuel in the United States. The production of cellulosic ethanol from biomass has the potential to reduce current oil demand by one-third without reducing the food supply or damaging the environment. Currently, a biochemical conversion of biomass to ethanol involves three basic steps: (1) breakdown of raw biomass using heat and chemicals, (2) use of enzymes to breakdown plant cell wall materials into simple sugars, and (3) conversion of the sugars into ethanol using microbes. The long-term goal is to integrate the bioprocessing into a single step. Accomplishing this requires the development of genetically modified, multifunctional microbes or a stable mixed culture of microbes capable of carrying out all biologically mediated transformations needed for the complete conversion of biomass to ethanol. Research will be supported on a variety of enzymes and microbes that contribute (individually and together) to the conversion of cellulose to ethanol; analysis of enzymes to understand how they interact with and breakdown cellulose; a determination of the factors, such as temperature and different combinations of sugars, that influence biomass degradation or ethanol production; strategies for producing and maintaining stable mixed cultures of microbes; and improved capabilities for genetically engineering

<sup>1</sup>Does not include \$128.7 Million in Congressionally-directed projects.

microbes that produce bioethanol. This research will lead to increased understanding of microbe-based production of cellulosic ethanol, increased production efficiencies, and reduced costs that will make cellulosic ethanol a cost competitive alternative to gasoline in the coming decades.

Under certain conditions, green algae and a type of bacteria known as cyanobacteria can use energy from the sun to split water and generate hydrogen. This process, known as biophotolysis, has the potential to produce hydrogen on the scale necessary for meeting future energy demand. It also uses water as a source of hydrogen—a clean, renewable, carbon-free (i.e., non-fossil fuel based), substrate available in virtually inexhaustible quantities and is potentially the most efficient conversion of solar energy to hydrogen. Theoretically, the maximum energetic efficiency for direct biophotolysis is 40 percent compared with a maximum of about 1 percent for hydrogen production from biomass (Critical Reviews in Microbiology 31, 19–31, 2005). Research will include investigations on a range of hydrogen-producing enzymes and organisms, understanding how hydrogenase (the enzyme that cleaves water to produce hydrogen) work, the inhibition of hydrogenase activity by oxygen, and genetic regulatory and biochemical processes that influence hydrogen production. This new knowledge will be used to engineer microbes to use in hydrogen bioreactors or enzyme-catalysts to use in bioinspired nanostructures for hydrogen production.

In 2003, the administration launched the Climate Change Research Initiative (CCRI) to focus research on areas where substantial progress in understanding and predicting climate change, including its causes and consequences, is possible over the next 5 years. In fiscal year 2007, BER will contribute to the CCRI from four programs: Terrestrial Carbon Processes, Climate Change Prediction, ARM, and Integrated Assessment. Activities will be focused on (1) helping to resolve the North American carbon sink question (i.e., the magnitude and location of the North American carbon sink); (2) deployment and operation of a mobile ARM Cloud and Radiation Testbed facility to provide data on the effects of clouds and aerosols on the atmospheric radiation budget in regions and locations of opportunity where data is lacking or sparse; (3) using advanced climate models to simulate potential effects of natural and human-induced climate forcing on global and regional climate and the potential effects on climate of alternative options for mitigating increases in human forcing of climate; and (4) developing and evaluating assessment tools needed to study costs and benefits of potential strategies for reducing net carbon dioxide emissions.

In fiscal year 2007, BER SciDAC-enabled activities will allow climate scientists to gain unprecedented insights into potential effects of energy production and use on the global climate system. BER will also add a SciDAC component to GTL and Environmental Remediation research. GTL SciDAC will initiate new research to develop mathematical and computational tools needed for complex biological system modeling and for analysis of complex data sets, such as mass spectrometry data. Environmental Remediation SciDAC will provide an opportunity for subsurface and computational scientists to develop and improve methods of simulating subsurface reactive transport processes on “leadership class” computers.

Research emphasis within BER’s Environmental Remediation Sciences subprogram will be focused on issues of subsurface cleanup such as defining and understanding the processes that control contaminant fate and transport in the environment and providing opportunities for use, or manipulation of natural processes to alter contaminant mobility. The resulting knowledge and technology will assist DOE’s environmental clean-up and stewardship missions. Funding for experimental equipment recapitalization at the William R. Wiley Environmental Molecular Sciences Laboratory (EMSL) at Pacific Northwest National Laboratory (PNNL) will be increased in fiscal year 2007.

BER will also continue in fiscal year 2007 to support fundamental research in genomics, medical applications and measurement science, and the health effects of low dose radiation. Resources are developed and made widely available for determining protein structures at DOE synchrotrons, for high-throughput genetic studies using mice, and for DOE-relevant high-throughput genomic DNA sequencing. Building on DOE capabilities in physics, chemistry, engineering, biology and computation, BER supports fundamental imaging research, maintains core infrastructure for imaging research, and develops new technologies to improve the diagnosis and treatment of psycho-neurological diseases and cancer and to improve the function of patients with neurological disabilities such as blindness.

*High Energy Physics*

*Fiscal Year 2006 Appropriation—\$716.7 Million; Fiscal Year 2007 Request—\$775.1 Million*

The High Energy Physics (HEP) program provides over 90 percent of the Federal support for the Nation's high energy physics research. This research advances our understanding of how the universe works at its most basic level, from the elementary constituents of matter to the recently discovered but still mysterious dark energy and dark matter that so dominate our universe. Our research aims to solve one of Nature's deepest paradoxes: why does the universe appear to be made of matter but not antimatter? How can the laws of the atom and those of cosmological gravity resolve themselves to Einstein's long-sought unified theory of matter and force? HEP provides research facilities and advances our knowledge, not only in high energy physics, but increasingly in other fields, including particle astrophysics and cosmology. Research advances in one field often have a strong impact on research directions in another. Technology that was developed in response to the demands of high energy physics research has also become indispensable to other fields of science and has found wide applications in industry and medicine, often in ways that could not have been predicted when the technology was first developed. Examples include medical imaging, radiation therapy for cancer using particle beams, ion implantation of layers in semiconductors, materials research with electron microscopy, and the World Wide Web. The accelerator technologies of high-power X-ray light sources, from synchrotron radiation facilities to the new coherent light sources, are all derived from high energy physics accelerator technology.

The U.S. HEP program in fiscal year 2007 will continue to lead the world with forefront user facilities at the Fermi National Accelerator Laboratory (Fermilab) and SLAC that help answer the key scientific questions outlined above, but these facilities are scheduled to complete their scientific missions by the end of the decade. Thus, the longer-term HEP program supported by this request begins to develop new world-leading facilities in targeted areas (for example, neutrino physics) that will establish a U.S. leadership role in these areas in the next decade. Further, HEP has prioritized current R&D efforts to select those which will provide the most compelling science opportunities in the coming decade within the available resources. For these reasons, the highest priority R&D effort is the development of the proposed International Linear Collider (ILC), and this request significantly advances the ILC R&D program. In making these decisions HEP has carefully considered the recommendations of the High Energy Physics Advisory Panel (HEPAP) and planning studies produced by the U.S. scientific community, including the National Academy of Sciences.

R&D in support of the ILC is doubled relative to fiscal year 2006 to support a U.S. leadership role in a comprehensive, coordinated international R&D program, and to provide a basis for U.S. industry to compete successfully for major subsystem contracts. The long-term goal of this effort is to support a decision on a construction start of an international electron-positron linear collider around the end of the decade. In fiscal year 2005 an international collaboration called the Global Design Effort (GDE) was organized to coordinate the R&D and design of a linear collider.

To provide a nearer-term future HEP program, and to preserve future research options, R&D for accelerator and detector technologies, particularly in the growing area of neutrino physics, will continue at an increased level relative to fiscal year 2006. With Tevatron improvements completed, much of the accelerator development effort at Fermilab in fiscal year 2007 will focus on the neutrino program to study the universe's most prolific particle. The Neutrinos at the Main Injector (NuMI) beam allows studies of the fundamental physics of neutrino masses and mixings using the proton source section of the Tevatron complex. NuMI has begun operations and will eventually put much higher demands on that set of accelerators. A program of enhanced maintenance, operational improvements, and equipment upgrades is being developed to meet these higher demands, while continuing to run the Tevatron. Engineering design will begin on a new detector optimized to detect electron neutrinos, the Electron Neutrino Appearance (EvA) Detector, which will utilize the NuMI beam. Participation will begin in a reactor-based neutrino experiment. Meanwhile, R&D will continue for a high-intensity neutrino super beam facility and a double beta decay experiment. These efforts are part of a coordinated neutrino program developed from an American Physical Society study and a joint HEPAP/Nuclear Sciences Advisory Committee (NSAC) subpanel review.

In order to exploit the unique opportunity to expand the boundaries of our understanding of the matter-antimatter asymmetry in the universe, a high priority is given to continued operations and infrastructure support for the B-factory at SLAC. Upgrades to the accelerator and detector are currently scheduled for completion in

2006, and our baseline plan is to have B-factory operations conclude in fiscal year 2008. We are also engaging with our advisory panels and international collaborating partners on the precise timetable for completion of B-Factory operations and follow-on data analyses.

As the Large Hadron Collider (LHC) accelerator nears its turn-on date in 2007, U.S. activities related to fabrication of detector components will be completed and new activities related to commissioning and pre-operations of these detectors, along with software and computing activities needed to analyze the data, will ramp-up significantly. A scientifically vigorous role for U.S. research groups in the LHC physics program will continue to be a high priority of the HEP program.

In order to explore the nature of dark energy, support for R&D on competitively-selected dark energy space-based mission concepts, including the Super Nova/Acceleration Probe (SNAP), will be significantly increased in fiscal year 2007. SNAP will be a mission concept proposed for a potential interagency sponsored experiment with NASA, the Joint Dark Energy Mission (JDEM). This joint mission will provide important new information about the nature of dark energy that will in turn lead to a better understanding of the birth, evolution, and ultimate fate of the universe. In fiscal year 2007, R&D will also be supported for ground facilities (in cooperation with NSF) and/or a variety of space-based facilities which could provide independent and complementary measurements of the nature of dark energy. Advice from the scientific community will be solicited to aid in selecting the particular concepts to be developed.

In fiscal year 2005, the HEP program completed the original SciDAC programs in the areas of accelerator modeling and design, theoretical physics, astrophysics, and applying grid technology. Each of these projects has made significant strides in forging new and diverse collaborations (both among different disciplines of physics and between physicists and computational scientists) that have enabled the development and use of new and improved software for large-scale simulations. To build on these successes, the HEP program will re-compete its SciDAC portfolio in fiscal year 2006 to obtain significant new insights through computational science into challenging problems that have the greatest impact in HEP mission areas.

#### *Nuclear Physics*

*Fiscal Year 2006 Appropriation—\$367.0 Million; Fiscal Year 2007 Request—\$454.1 Million*

The Nuclear Physics (NP) program is the major sponsor of fundamental nuclear physics research in the Nation, providing about 90 percent of Federal support. NP builds and operates world-leading scientific facilities and state-of-the-art instrumentation to study the evolution and structure of nuclear matter, from the smallest building blocks, quarks and gluons, to the stable elements in the Universe created by stars. Key aspects to these studies are understanding how the quarks and gluons combine to form the nucleons (proton and neutron), what are the properties and behavior of nuclear matter under extreme conditions of temperature and pressure, and what are the properties and reaction rates for atomic nuclei up to their limits of stability. Results and insight from these studies are relevant to understanding how the universe evolved in its earliest moments, how the chemical elements were formed, and how the properties of one of Nature's basic constituents, the neutrino, influences astrophysics phenomena such as supernovae. Nuclear physics also has had great impact on human life. Knowledge and techniques developed in pursuit of fundamental nuclear physics research are extensively utilized in our society today. The understanding of nuclear spin enabled the development of magnetic resonance imaging for medical use. Radioactive isotopes produced by accelerators and reactors are used for medical imaging, cancer therapy, and biochemical studies. Advances in cutting-edge instrumentation developed for nuclear physics experiments have relevance to technological needs in combating terrorism. The highly trained scientific and technical personnel in fundamental nuclear physics that are a product of the program are a valuable human resource for many applied fields.

The fiscal year 2007 budget request increases support for operations and research by ~21 percent compared to fiscal year 2006. At this funding level, overall operations of the four National User Facilities and research efforts at universities and laboratories are supported at near optimal levels. This will allow researchers to make effective progress towards the program's scientific goals and milestones. In fiscal year 2007 modest funding is provided for generic exotic beam R&D directed towards development of capabilities for forefront nuclear structure and astrophysics studies and to understand the origin of the elements from iron to uranium.

When the Universe was a millionth of a second old, nuclear matter is believed to have existed in its most extreme energy density form called the quark-gluon plasma. Experiments at the Relativistic Heavy Ion Collider's (RHIC) at Brookhaven Na-

tional Laboratory (BNL) are searching to find and characterize this new state. These efforts will continue in fiscal year 2007, with increased support. NP, together with the National Aeronautics and Space Administration (NASA), begins construction of a new Electron Beam Ion Source (EBIS) to provide RHIC with more cost-effective, reliable, and versatile operations. Research and development activities, including the development of an innovative electron beam cooling system for RHIC, are expected to demonstrate the feasibility of increasing the luminosity or collision rate of the circulating beams by a factor of 10. In addition to RHIC efforts, the High Energy Density Physics activities include NP contributions to enhance the heavy ion triggering and measurement capabilities of LHC experiments under construction and the accompanying research program at universities and laboratories. Experiments at the LHC would permit measurements of the earliest highest energy density stage in the formation and development of matter at different conditions than those created at RHIC. The interplay of the different research programs at the LHC and the ongoing RHIC program will allow a detailed tomography of the hot, dense matter as it evolves from the “perfect fluid” (a fluid with zero viscosity) discovered at RHIC.

Operations of the Continuous Electron Beam Accelerator Facility (CEBAF) at Thomas Jefferson National Accelerator Facility (TJNAF) in fiscal year 2007 will continue to advance our knowledge of the internal structure of protons and neutrons, particularly a unique property called “confinement” that binds together their fundamental constituents, particles called quarks and gluons. By providing precision experimental information concerning the quarks and gluons that form the protons and neutrons, the approximately 1,000 experimental researchers that use CEBAF, together with researchers in nuclear theory, seek to provide a quantitative description of nuclear matter in terms of the fundamental theory of the strong interaction, Quantum ChromoDynamics. In fiscal year 2007, the accelerator provides beams simultaneously to all three experimental halls and Project Engineering Design (PED) activities begin on the 12 GeV CEBAF Upgrade. This cost-effective upgrade would allow for a test of a proposed mechanism of “quark confinement”—one of the compelling unanswered puzzles of physics.

Efforts at the Argonne Tandem Linear Accelerator System (ATLAS) at ANL and the Holifield Radioactive Ion Beam Facility (HRIBF) at ORNL will be supported in fiscal year 2007 to focus on investigating new regions of nuclear structure, studying interactions in nuclear matter like those occurring in neutron stars, and determining the reactions that created the nuclei of the chemical elements inside stars and supernovae. The GRETINA gamma-ray tracking array, currently under fabrication, will revolutionize gamma ray detection technology and offers dramatically improved capabilities to study the structure of nuclei at ATLAS, HRIBF, and elsewhere. The Fundamental Neutron Physics Beamline (FNPB) under fabrication at the SNS will provide a world-class capability to study the neutron decay properties, leading to a refined characterization of the weak force. Investments are made to initiate the fabrication of a neutron Electric Dipole Moment experiment, to be sited at the FNPB, in the search for new physics beyond the Standard Model.

The Nuclear Physics program funds SciDAC programs in the areas of theoretical physics (National Computational Infrastructure for Lattice Gauge Theory), astrophysics (Shedding New Light on Exploding Stars: TeraScale Simulations of Neutrino-Driven Supernovae and their Nucleosynthesis), and grid technology (Particle Physics Data Grid Collaborative Pilot). In fiscal year 2006 proposal applications will be evaluated for new or renewal SciDAC grants.

The Low Energy subprogram and the Theory subprogram, through their activities at the Nuclear Data Center, will support increased basic research efforts relevant to advanced nuclear fuel cycle issues. These subprograms will support nuclear data efforts and selected experiments that will lead to improvements in nuclear reaction cross-sections needed to calculate with reduced uncertainties the transmutation behavior for proposed advanced fuel cycles.

#### *Fusion Energy Sciences*

*Fiscal Year 2006 Appropriation—\$287.7 Million; Fiscal Year 2007 Request—\$318.9 Million*

The Fusion Energy Sciences (FES) program advances the theoretical and experimental understanding of plasma and fusion science, including a close collaboration with international partners in identifying and exploring plasma and fusion physics issues through specialized facilities. The FES program supports research in: plasma science; magnetically confined plasmas; advances in tokamak design; innovative confinement options; nonneutral plasma physics and High Energy Density Physics (HEDP); and cutting edge technologies. FES also leads U.S. participation in ITER, an experiment to study and demonstrate the sustained burning of fusion fuel. This

international collaboration will provide an unparalleled scientific research opportunity with a goal of demonstrating the scientific and technical feasibility of fusion power. Fusion is the energy source that powers the sun and stars. Fusion power could play a key role in U.S. long-term energy plans and independence because it offers the potential for plentiful, safe and environmentally benign energy.

The site selection for the international ITER Project, Cadarache, France, in the European Union, was a major six-party decision on June 28, 2005, at a Ministerial-level meeting in Moscow, Russia. Negotiations continued throughout the Fall of 2005, which led to the ITER parties (a) approving and welcoming the designated Director General Nominee chosen to lead the ITER organization, (b) approving and welcoming India into the ITER negotiations as a full non-host ITER party, and (c) completing the text of the draft ITER Agreement. In accordance with the Energy Policy Act of 2005, and as determined during the Fall 2005 ITER negotiations, the ITER Agreement directly addresses the following EPAct requirements:

- (i) clearly defines the U.S. financial contribution to construction and operations (as well as deactivation and decommissioning), as well as any other project costs associated with the project,
- (ii) ensures that the share of high-technology components of ITER that are manufactured in the United States is at least proportionate to the U.S. financial contribution to ITER,
- (iii) ensures, by virtue of the in-kind contribution procurement approach, that the United States will not be financially responsible for cost overruns in components manufactured by other ITER parties,
- (iv) guarantees the United States full access to all data generated by ITER,
- (v) enables U.S. researchers to propose and carry out an equitable share of experiments on ITER,
- (vi) provides the United States with a role in all collective decision-making related to ITER, and
- (vii) describes and defines the process for discontinuing and decommissioning ITER and the U.S. role in that process.

The U.S. Contributions to ITER project is being managed by the U.S. ITER Project Office (USIPO), established as a Princeton Plasma Physics Laboratory (PPPL)/Oak Ridge National Laboratory (ORNL) partnership. The fiscal year 2007 request for the U.S. Contributions to ITER Major Item of Equipment (MIE) project maintains the overall Total Project Cost funding cap of \$1,122,000,000. The U.S. effort will be consistent with the other ITER parties in the pace of starting the long lead procurements, in providing increased numbers of personnel to the ITER Organization, and in providing cash for common expenses. The profile is preliminary until the baseline scope, cost, and schedule for the MIE project are established, and the Director General Nominee and ITER Organization have achieved a standard mode of operation.

In support of ITER and U.S. Contributions to ITER, FES is placing increased emphasis on its national burning plasma program—a critical underpinning to the fusion science in ITER. FES plans to enhance burning plasma research efforts across the U.S. domestic fusion program, including: ITER R&D support both in physics and technology and exploring new modes of improved or extended ITER performance; developing safe and environmentally attractive technologies necessary for ITER; exploring fusion simulation efforts that examine the complex behavior of burning plasmas in tokamaks; carrying out experiments on our national FES facilities with diagnostics and plasma control that can be extrapolated to ITER; and integrating all that is learned into a forward-looking approach to future fusion applications.

The Energy Policy Act of 2005 Sec. 972(c)(5)(C) requires the Secretary of Energy to provide “a report describing how United States participation in the ITER will be funded without reducing funding for other programs in the Office of Science (including other fusion programs) . . .”. The Department’s fiscal year 2007 budget provides for healthy increases for all programs within the Office of Science and supports the ITER request of \$60,000,000 almost entirely from new funds in the Fusion Energy Sciences (FES) budget request.

The Director of the Office of Science has stated that the FES program in the Office of Science will reasonably bear at least some of the cost of building ITER from within its budget and that ITER will not unduly harm funding of other Office of Science research programs. The Department expects that the \$1.122 billion ITER funding profile could have some effect on the overall allocation of funds, both within the FES program and within the Office of Science, in future budgets. This has been and will continue to be the standard practice for funding large, capital-intensive projects within DOE. Nevertheless, as demonstrated by this fiscal year 2007 request, the Office of Science can fund ITER while maintaining healthy funding for other research programs.

The research and facility operations funding for the three major facilities will increase from the fiscal year 2006 level. Operations at the largest facility, DIII-D, will increase from 7 weeks in fiscal year 2006 to 12 weeks in fiscal year 2007, while operations at C-Mod at MIT and NSTX at PPPL will each increase by 1 week over fiscal year 2006, to 15 and 12 weeks respectively. A new baseline was established in July 2005 for the National Compact Stellarator Experiment (NCSX), a joint PPPL/ORNL advanced stellarator experiment being built at PPPL. It results in a 14-month delay in the schedule with completion in July 2009 and a new TEC of \$92,401,000. The fiscal year 2007 request supports the new baseline. Funding for the FES SciDAC program will increase in fiscal year 2007 to continue development of tools that facilitate international fusion collaborations and initiate development of an integrated software environment that can accommodate the wide range of space and time scales and the multiple phenomena that are encountered in simulations of fusion systems. Within SciDAC, the Fusion Simulation Project is a major initiative involving plasma physicists, applied mathematicians, and computer scientists to create a comprehensive set of models of fusion systems, combined with the algorithms required to implement the models and the computational infrastructure to enable them to work together.

Other changes include redirections in fusion theory, High Energy Density Physics, research in heavy ion beam science, plasma technology and materials research, and experimental plasma research. Congressionally-directed, non-defense research at the Atlas pulsed power facility is discontinued in fiscal year 2007.

#### *Science Laboratories Infrastructure*

*Fiscal Year 2006 Appropriation—\$41.7 Million; Fiscal Year 2007 Request—\$50.9 Million*

The mission of the Science Laboratories Infrastructure (SLI) program is to enable the conduct of DOE research missions at the Office of Science laboratories by funding line item construction projects to maintain the general purpose infrastructure and the clean up for reuse or removal of excess facilities. The program also supports Office of Science landlord responsibilities for the 24,000-acre Oak Ridge Reservation and provides Payments in Lieu of Taxes (PILT) to local communities around ANL-East, BNL, and ORNL.

In fiscal year 2007, SLI will initiate funding for four construction projects: the Seismic Safety Upgrade of Buildings, Phase I, at the Lawrence Berkeley National Laboratory (LBNL); the Modernization of Building 4500N, Wing 4, Phase I, at ORNL; the Building Electrical Services Upgrade, Phase II, at the ANL; and Renovate Science Lab, Phase I, at BNL. Funding for the PNNL Physical Sciences Facility is requested in the National Nuclear Security Administration's (NNSA's) Nuclear Non-Proliferation R&D program for fiscal year 2007. This project is cofunded by the Office of Science, NNSA, and the Department of Homeland Security. The demolition of the Bevatron at LBNL is funded at \$14.0 million.

#### *Workforce Development for Teachers and Scientists*

*Fiscal Year 2006 Appropriation—\$7.1 Million; Fiscal Year 2007 Request—\$10.9 Million*

The mission of the Workforce Development for Teachers and Scientists (WDTS) program is to provide a continuum of educational opportunities to the Nation's students and teachers of science, technology, engineering, and mathematics (STEM).

The Laboratory Science Teacher Professional Development (LSTPD) program increases to expand participation from 108 teachers in fiscal year 2006 to 300 in fiscal year 2007. The Faculty Sabbatical activity was initiated in fiscal year 2005 for faculty from Minority Serving Institutions (MSI) and reduced in fiscal year 2006 due to feedback from MSI faculty who expressed their inability to participate in sabbatical programs and a preference for shorter fellowship-type opportunities. Fiscal year 2007 participation will be reduced to two faculty members. The Science Undergraduate Laboratory Internship (SULI) programs will be increased to add approximately 55 students. The Albert Einstein Distinguished Educator Fellowship and the National and Middle School Science Bowls will all continue.

#### *Science Program Direction*

*Fiscal Year 2006 Appropriation—\$159.1 Million; Fiscal Year 2007 Request—\$170.9 Million*

Science Program Direction (SCPD) enables a skilled, highly motivated Federal workforce to manage the Office of Science's basic and applied research portfolio, programs, projects, and facilities in support of new and improved energy, environ-

mental, and health technologies. SCPD consists of two subprograms: Program Direction and Field Operations.

The Program Direction subprogram is the single funding source for the Office of Science Federal staff in headquarters responsible for managing, directing, administering, and supporting the broad spectrum of Office of Science disciplines. This subprogram includes planning and analysis activities, providing the capabilities needed to plan, evaluate, and communicate the scientific excellence, relevance, and performance of the Office of Science basic research programs. Additionally, Program Direction includes funding for the Office of Scientific and Technical Information. The Field Operations subprogram is the funding source for the Federal workforce in the Field responsible for management and administrative functions performed within the Chicago and Oak Ridge Operations Offices, and site offices supporting the Office of Science laboratories and facilities.

In fiscal year 2007, Program Direction funding increases by 7.4 percent. Most of the increase will support an additional 25 FTEs for program management positions, to address recent committee of visitor recommendations and to manage the increase in the research activities in the fiscal year 2007 budget. The increase also supports a 2.2 percent pay raise; an increased cap for SES basic pay; other pay-related costs such as the government's contributions for employee health insurance and Federal Employees' Retirement System (FERS); escalation of non-pay categories, such as travel, training, and contracts; and increased e-Gov assessments and other fixed operating requirements across the Office of Science complex. Finally, the increase will cover requirements not requested in previous budget requests, including travel expenses of Office of Science Advisory Committee members and requirements related to Appendix A of OMB Circular A-123, Management's Responsibility for Internal Control.

#### *Safeguards and Security*

*Fiscal Year 2006 Appropriation—\$68.0 Million; Fiscal Year 2007 Request—\$71.0 Million*

The Safeguards and Security (S&S) program ensures appropriate levels of protection against unauthorized access, theft, diversion, loss of custody, or destruction of DOE assets and hostile acts that may cause adverse impacts on fundamental science, national security or the health and safety of DOE and contractor employees, the public or the environment. The Office of Science's Integrated Safeguards and Security Management strategy encompasses a tailored approach to safeguards and security. As such, each site has a specific protection program that is analyzed and defined in its individual Security Plan. This approach allows each site to design varying degrees of protection commensurate with the risks and consequences described in their site-specific threat scenarios.

The fiscal year 2007 budget will ensure adequate security posture for Office of Science facilities by protecting fundamental science, national security, and the health and safety of DOE and contractor employees, the public and the environment. Fiscal year 2007 includes funding necessary to protect people and property at the 2003 Design Basis Threat (DBT) level. In fiscal year 2007, an increase in funding for the Cyber Security program element is being requested to begin to address the promulgation of new National Institute of Standards and Technology (NIST) requirements which are required by the Federal Information Security Management Act (FISMA) to improve the Federal and an Office of Science laboratory cyber security posture.

#### CONCLUSION

I want to thank you, Mr. Chairman, for providing this opportunity to discuss the Office of Science research programs and our contributions to the Nation's scientific enterprise. On behalf of DOE, I am pleased to present this fiscal year 2007 budget request for the Office of Science.

This concludes my testimony. I would be pleased to answer any questions you might have.

Senator DOMENICI. First I want to commend you for your approach to enhancing this office and trying to get it on the path that is declared by the President and those who pursue it with vigor, doubling the office. We have all wanted it to move in the direction you are talking about. Let us hope you can keep it going that way. That has tremendous, tremendous consequences for our children and our country's future and nobody quite figures that when you

use all these words, but believe it. That is what it is. It is developing the capacity to make sure that the brains of our young people of the future are able to be truly fully developed in competition with the world. That is what we are talking about.

Now, having said that, you heard some concerns. Does any one or two things pop out that you would like to answer right now, or would you like to move on?

Dr. ORBACH. I think I would prefer to move on and respond to questions.

Senator DOMENICI. All right, we are going to start questioning, and we are going to start with the Senator from Colorado.

NATIONAL RENEWABLE ENERGY LABORATORY

Senator ALLARD. Thank you, Mr. Chairman.

I want to start out with the National Renewable Energy Laboratory in Colorado. As you know, you are aware of its importance and I know that you are also aware of the difficulties we have had there. I guess the question that comes to mind is, do you believe that the Department of Energy has all the tools it needs to see that a situation like that never occurs again?

Mr. GARMAN. No, sir I do not. I have begun to explore with the subcommittee staff a new tool that might help us in the future have greater flexibility. This tool involves being able to get at some old program dollars that are nonperforming or underperforming and get them in the game so that we can have more flexibility to prevent that sort of thing from happening again. The subcommittee staff has been very accommodating in listening to our ideas and we think we can come up with—

Senator ALLARD. I appreciate your efforts in that regard. What portion of your budget is disbursed based on earmarks and what portion is given under grants?

Mr. GARMAN. It varies by program. In the Office of Energy Efficiency and Renewable Energy, which has received a significant amount of attention, the biomass program is earmarked or subjected to congressionally directed spending of 57 percent of the total program dollars, geothermal 16 percent, solar 17 percent, wind 33 percent, freedom car and vehicle technologies 11 percent. Those are the major earmarked programs.

Senator ALLARD. What was the last one?

Mr. GARMAN. Freedom car and vehicle technologies.

Senator ALLARD. I see. What was the percentage on that?

Mr. GARMAN. 11 percent.

I do not want to be misconstrued. Some of the congressionally directed projects are very good projects and let me say that out front. We have some projects, excellent work, excellent R&D outputs, and the only negative thing that anyone in the program could say about it is that it was not competitively awarded.

But we do subject these programs to merit review after the fact and we evaluate them and we try to get the very best R&D outputs that we can out of them. So I do not want this to be misconstrued—they have presented us with some challenges, but they also have presented us with some opportunities.

Senator ALLARD. Well, I thank you for your willingness to try and work with the committee and work with our office.

Senator DOMENICI. What is an earmark? How did he—did he define an “earmark” there?

Mr. GARMAN. No, sir.

Senator DOMENICI. Could we do that, Senator? Would that be all right, if I asked him what that means?

Senator ALLARD. Yes, go ahead.

Mr. GARMAN. Our definition of an earmark is, in its simplest form, when the recipient of the funding is designated.

Senator DOMENICI. Is designated by the law?

Mr. GARMAN. In the report language, the report language will specify projects, and our consultations with the subcommittee staff will designate the recipient in many cases.

Senator ALLARD. Thank you for following up on that, Mr. Chairman.

#### ROCKY FLATS MINERAL RIGHTS

Let me also go on to Rocky Flats. Last year Congress passed legislation at my behest that authorized the Secretary of Energy to purchase some mineral rights at Rocky Flats. This authority was provided just for 1 year and I understand that minimal progress has been made so far. What is the Department of Energy’s plan for purchasing the essential mineral water rights there at Rocky Flats and when do you expect this transaction to be completed?

Mr. GARMAN. I am going to have to take that question for the record, Senator, and get back to you on that quickly, if I can.

[The information follows:]

#### ROCKY FLATS LITIGATION

I have not personally been involved with this case, but I am informed that the Department’s lawyers’ oversight of it has been quite proactive. They advise that there is no evidence that properties in the vicinity of Rocky Flats suffered extensive damage. Just last year the Agency for Toxic Substances and Disease Registry (ATSDR) issued a report concluding that the “studies and sampling data generated by numerous parties, including the U.S. Environmental Protection Agency (EPA), the Colorado Department of Public Health and Environment (CDPHE), the U.S. Department of Energy (DOE) and its contractors and local community groups, universities and private researchers . . . paint a consistent picture of the public health implications of environmental contamination” near Rocky Flats, and that picture is that “past, current and future exposures are below levels associated with adverse health effects.” In fact, ATSDR reported that “estimated total exposures to radiation from the soil . . . are 3,000 times lower than the average exposures to ionizing radiation experienced by United States residents.”

Senator ALLARD. I would appreciate it if you would. This is something that is really important to get that wrapped up. We want to transfer that over to the Department of the Interior to be managed as a refuge. That cannot happen until we get this issue resolved. So it is important, I think, that we get this taken care of. I have received some information regarding that perhaps maybe it was not progressing along as it should and if it is not I would like to know why and what the hold-up is on that. So the sooner you get back to us, I would appreciate it very much.

Mr. GARMAN. Yes, sir.

Senator ALLARD. With regard to—it looks like my time has expired, Mr. Chairman.

Senator DOMENICI. Thank you very much.

Senator Murray.

## PNNL 300 AREA

Senator MURRAY. Thank you, Mr. Chairman.

Dr. Orbach, as you know, when we talk about Hanford cleanup the plant and tank farms are the first thing that comes to everybody's mind, but there is a lot of work to be done across the complex and progress is being made. The river corridor cleanup, which includes the 300 Area, is moving forward better than expected right now, but there is an obstacle out there. As you well know, the PNNL has a lot of capabilities. It is housed in that 300 Area and it has to exit those facilities and relocate.

The Capability Replacement Laboratory project has been devised to meet that need and the goal of that project is to keep both the cleanup at the Hanford site and the PNNL work on track. In December of last year, the CD-1 for this project which outlined a schedule for the PNNL exit was approved. But it now appears that this schedule is going to cause a delay in the river corridor cleanup. Are you familiar with that issue?

Dr. ORBACH. Yes, I am, Senator. I believe that the 2015 date is still on track and that we can meet that commitment. The change has been a consequence of the complexity of the facilities required to receive the workers who are in the 300 Area. But we now have a robust plan with both the—

Senator MURRAY. You do understand it is going to be a cause of delay now without additional funding?

Dr. ORBACH. The funding is actually on track. There has been a delay, that is correct. But the target date still remains.

Senator MURRAY. Well, within the 2007 budget request all of the funding is contained in the NNSA budget. Can you explain why there are no Office of Science funds that are requested?

Dr. ORBACH. Yes. It is simply a question of phasing. The Office of Science funding in terms of our responsibility will show up in the fiscal year 2008 budget and it is just a question of when—which agency puts its funding in. But as I say, we have a phased structure for both the Office of Science, NNSA, and also DHS to create the facilities that will be required to move people from the 300 Area.

Senator MURRAY. So there is no delay due to the PNNL exit schedule?

Dr. ORBACH. There is no delay with regard to the river corridor commitment. There is a—we have extended the closing of the 300 Area so that we can—

Senator MURRAY. To accommodate that.

## WASTE TREATMENT PLANT

Dr. ORBACH. To accommodate a proper facility, yes.

Senator MURRAY. Well, I want to keep working with you on this because it obviously has a big impact on our State, and I appreciate the work we have done on that.

Mr. Chairman, I see that Assistant Secretary Rispoli is in the office and I wanted to ask him a question, with your permission, about the EM budget regarding the vit plant and if he could just tell us where we are on that and give us a quick update on how

we are going to address the new cost and schedule while he is here, if you would not mind.

Senator DOMENICI. I have no objection, unless you all do.

All right. If there is none, let us—state your name and glad to have you here.

Mr. RISPOLI. Thank you, Mr. Chairman. Mr. Chairman, members of the subcommittee, I am Jim Rispoli, the Assistant Secretary for Environmental Management.

Senator, I would be happy to take your question.

Senator MURRAY. Thank you. I just wondered if you could give us while you are here a quick update of where we are on the vit plant. We all know there is a long road ahead of us. I appreciate the better communications we are having this year. But if you could just give the committee a quick update on where we are on this, how we are going to address the technical issues, and where we stand on the new cost and schedule baseline.

Mr. RISPOLI. I would be happy to. As you all know, the budget that was submitted as part of the President's budget did not yet incorporate any of the new cost estimates that are being worked, but subsequent to the budget being delivered, in fact within just the several weeks afterward, we began delivering reports to the appropriate committees and subcommittees in the Congress as well as to the delegation of Washington State.

We have now got approximate costs that have not been validated by the Corps of Engineers, which is doing that effort for us. So quickly where we are: The estimates that we have to date are in the range of \$10 to \$11 billion. That does not necessarily include risk that is not within the control of the contractor or the Department. That is called programmatic risk and that is addressed in some of the reports that we have delivered. But we are in that range.

Meanwhile, the Army Corps of Engineers is reviewing a technical estimate for the project cost and schedule that amounts to, I am told, 87 looseleaf volumes of information. They will be complete with the evaluation of the whole estimate late this summer, in time for us to communicate that to the Congress.

But the figures that I gave you are the range that we are talking about. We have worked very vigorously to address the issues. They are broken into three categories. One of them is project management types of issues and we have taken strong action based upon several of the reports that we have received and provided to you and the subcommittee and the committees. We have taken vigorous action to improve our project management both at the site and at the headquarters by addition of key qualified personnel. For example, we have certified—the project manager there has been certified by an independent board last December as qualified to be in charge of that project. We have added people in the project management area at both headquarters and the field, including contracts type of people.

The technical issues, as you know, are very complex, and we did deliver a report to this subcommittee and other committees and your delegation. We have identified through bringing in a team of best and brightest from all segments of the industry, not just Bechtel but their competitors, academia, other areas, and have identi-

fied the technical issues. The team, the technical team, believes all of these can be solved, but the good point is that we have them on the table now so that we can solve them now and do not have to confront them downstream as new surprises at that point.

So we consider this to be a major accomplishment that we have brought in this team of very accomplished people to look at the technical issues.

Senator MURRAY. I really appreciate that and I appreciate your staying in touch with us and communicating on this. Obviously it is going to have an impact. But my concern is now the vit plant is going to be delayed, but the cleanup of the tanks is still a really pressing issue, and how are we going to pay for that when there is no funding for supplemental treatment in the budget?

Mr. RISPOLI. Yes, I understand the question. The question is that we have been evaluating a supplemental treatment that is called bulk vitrification. I have visited the site several times to see the mockup of how that process would work. Our intent is that this summer—I should mention that I have spoken with executives at both CH2M Hill, which is the prime contractor, as well as to corporate officers of AMEC, which is the subcontractor that is doing that.

Our objective is to get a cost and schedule estimate—we call it a baseline—this summer that we can then independently validate. We do not know—

Senator MURRAY. Including the treatment?

Mr. RISPOLI. Including that—this is for the supplemental treatment.

We do not know at this point what the spending profile would be because we do not yet have the cost and schedule estimate in our hands to then be able to independently review.

Senator MURRAY. But you expect to have that for us by the end of the summer so we can know what this committee appropriations bill will need—

Mr. RISPOLI. We expect to have that information from the AMEC subcontractor through the prime contractor by the end of the summer, so that we can then independently evaluate it and determine the best path forward. In the mean time, however, the funds that we have got right now are being used to develop that cost and schedule estimate.

As I have stated before for the record, we need supplemental technology. As you know, the vitrification plant on the low activity waste side is not designed to handle 100 percent of the low activity waste. So we need the supplemental technology. We believe this is the viable approach to do it. We just need the cost and schedule estimates that reflect the solution. They have technology issues as well that are being solved, and once we have that and validate it we will be able to communicate that to the Congress to come up with a path forward for that.

Senator MURRAY. Well, I am concerned that we appear to have a gap in funding and I want to pursue that. Mr. Chairman, I know my time is up, but I would like to continue to have a conversation with you about this, because this really is a critical issue for all of us.

Mr. RISPOLI. Yes, Senator, I understand your point.

Senator MURRAY. Thank you.  
Mr. RISPOLI. Thank you.

#### COAL RESEARCH AND FUTUREGEN

Senator DOMENICI. Well, let me just say to all of you—and I guess this is a tribute to the top of the Department—I really am convinced that you are all trying to get this job done, and I am very impressed and enthused that we will get there, in spite of budget problems.

Let me take an issue that I want to try to understand. Could we bring Mr. Jarrett to sit by you, Mr. Under Secretary, and let me talk about coal, wherever he could fit there. Now, let me address the issue of coal in terms of what we are trying to do. We have a very serious problem in the transportation area of the United States, of using too much fuel that comes from overseas that are derivatives of oil. We have this big commodity over here in the United States called coal, which obviously scientifically is not too far afield from oil. They are very similar.

There are two things we have been trying to do. No. 1, we have been trying to clean up the coal as we burn it, and we all call that clean coal technology. No. 2, we have been trying to convert it to fuel, to liquid, so it can be used for fuel. The Nazis did a little bit of that to save them at the end of the war, right. You know that.

Mr. JARRETT. Yes.

Senator DOMENICI. It was not very terrific, good, but they did do some. We know how to do it. We have not moved very dramatically.

The last one has to do with global warming. We are working on the issue of how do you get carbon out of the coal as you burn it, as you convert it. There are different technologies, but we have been throwing around the word “sequester” or get the carbon out.

Now, whoever can best explain to me on the record here for 5 minutes, what is going on in terms of these three areas? Could you start with the last one first, the one of sequestration, sometimes referred to as America’s FutureGen project or program, or an effort to develop an IGCC facility? Now, where are we with reference to this in terms of the money we have and the program you have put before us as you have attempted to assimilate this?

I understand you are new, but you understand well, and I compliment you and congratulate you for taking the job, Mr. Jarrett.

Do you want to do that? Do you want to let him do that?

Mr. GARMAN. Sure.

Senator DOMENICI. All right.

#### CARBON SEQUESTRATION

Mr. JARRETT. There are a lot of questions in there, but I will start with the issue of carbon sequestration. As you know from conversations you and I have had previously, I am a strong believer that we need to advance our clean coal technology programs in this country because it is cheap, it is domestic, and it is plentiful. We can produce power from coal today and we do. Fifty-two percent of our electricity today comes from coal. We believe that coal will maintain or actually grow its market share in the decades to come, based on all of the projections.

The obstacle that we have with developing our coal resources are environmental, and I will say up front that today we have the technology to utilize our coal and take care of the environment. What we cannot do is do it at an affordable cost. So all of our clean coal technology programs are aimed at learning how to develop and utilize that vast resource that we have in this country in an affordable way.

Many of the problems have been resolved. Many of the environmental problems are well on the way to being resolved. But I think the Holy Grail for the coal program is to figure out the ways to eliminate carbon gas emissions from the combustion of coal in an affordable way. We are working on a couple of technology paths forward to do that. We are looking at more efficient ways to remove carbon gases in the existing fleet of pulverized coal powerplants that we have in this country.

Senator DOMENICI. I understand. Now just let me interrupt. Between you and the Secretary, just tell the committee. Our objective is to use Government to the extent we can to move this technology forward. We are not a sole player. The private sector wants to do this, too, right?

Mr. JARRETT. That is absolutely correct.

Senator DOMENICI. And it would be a great big victory for them. They have got a giant future use for coal and they are in business, and they have told climate change people, we have made a breakthrough, right?

Mr. JARRETT. Yes.

Senator DOMENICI. Now, what are we in this budget—how much money do we have directed at this effort between the two of you? And are we doing the right thing, and did you cut the program or did you move money around, and are we still moving ahead with FutureGen or whatever? Please tell me. A lot of people come to our offices, his and mine, telling us they have got a solution to this and you all just will not listen to them. They have been in there to see you and they have got this idea.

What is our role in all this? You have got my gist here. Just talk at me for 5 minutes. What are we doing about all this?

Mr. GARMAN. There are some common threads in here that we are looking to exploit. First of all, it has become clear that gasification of coal is a pathway that leads us to both liquefaction, that can give us liquid fuels, it can lead us to opportunities to sequester carbon dioxide, it can lead us to opportunities to make a cleaner-burning conventional coal plant through IGCC technology.

So gasification technology is something the Department has worked on for a long time and there are commercial gasifiers available today, just as there are commercial liquefaction plants available today. The South Africans have been making liquid fuels from coal. Syntroleum, an outfit that is working today, has technology to do that.

The real issue is there are some technology risks, but there are financial risks. These are more expensive. As I think Senator Bond was commenting, there are ways to make diesel fuel from coal today if you can finance something on the order of a \$6 billion plant for a 150,000 barrel-a-day capacity.

Getting financing for that is very tough in this market. If Wall Street was convinced that oil was going to stay high, then it might be easier. But it is a \$35 or \$40 per barrel threshold most likely in getting that kind of financing. So in that respect the loan guarantee authority could play an important role in getting these technologies, which we think will work and that they are proven, into the marketplace so we can get some experience.

There are companies, AEP among them, who is committed to building integrated combined cycle coal plants, gasifying the coal. There are companies, BP among them, who are looking at gasifying petroleum coke and sequestering the carbon dioxide in an enhanced oil recovery activity. These are all good things that are going on out there.

We think through a combination—FutureGen is really in my mind the project that tries to package these technologies together and demonstrate them as packaged technology in a way that has not been done before. Thus it is very important to us and we want to continue that work.

We also need to get the Office of Science more involved with us in the carbon sequestration aspect. They are going to do it and they are excited about the prospect, because we have to be able to convince the public that when we capture and sequester carbon dioxide in a saline aquifer or in an unminable coal seam or in an old oil and gas field that it is going to stay there, that it is not going to come out 10 or 50 or 100 years in the future.

Senator DOMENICI. We understand.

Mr. GARMAN. That is a scientifically rigorous process that, frankly, we need Dr. Orbach and his folks' help with.

So what I am trying to do is to paint a picture that we think, through partnerships with the private sector, partnerships with the Office of Science, we think that we are building a program that can demonstrate these technologies and validate the costs and get them ready for the private sector to take up.

The decision as to whether the private sector is going to do that in large part is dependent on their guesstimates of what you are going to do with respect to carbon.

Senator DOMENICI. They are going to make a marketplace decision.

Mr. GARMAN. That is right. If they think carbon is going to cost \$30 a ton, they will go in one direction. If they think carbon emissions are going to be free, they will go in another, in my view.

Senator DOMENICI. Mr. Jarrett, any further comments?

Mr. JARRETT. No.

Senator DOMENICI. Okay, good.

Senator ALLARD. Mr. Chairman, could I ask a question on that?

Senator DOMENICI. Yes.

Senator ALLARD. If we have carbon left over, these synthetic carbons, is that a potential use for that carbon? These are very lightweight, very tough materials.

Mr. GARMAN. Yes.

Senator ALLARD. Is that a place for the carbon?

Mr. GARMAN. Yes. Yes, it is. We do not necessarily have to take the carbon dioxide and put it in the ground. We can—it is poten-

tially possible to take this carbon from that stream and use it to make carbon fiber, to lightweight vehicles and what-not.

There are also interesting opportunities—and this is again part of why I am so excited about getting the Office of Science involved in this. There are things that we are not looking at that have great potential. An interesting example is there are folks in Arizona that are fooling around with the notion of taking a carbon dioxide stream directly from a coal plant, pumping it into brine water in the desert in between large panels of glass, growing algae, which flourishes in the brine water, exposed to all this carbon dioxide, and taking that algae twice a day, harvesting it twice a day because it grows so quickly, and turning that into ethanol, which is an interesting and novel approach.

This is something that other folks are looking at. Now that we are in essence getting the Office of Science more integrated with us, which is long overdue and a great credit to Dr. Orbach, these are the sorts of things that we hope we are able to get involved in.

Senator DOMENICI. But all this is not tomorrow. People are asking if we are going to get this done, are we going to get somebody to propose to build a \$6 billion IGCC plant within the next year, do we have a program in place that might facilitate somebody doing that.

Mr. GARMAN. That was a coal liquefaction plant. The IGCC plant could come in below that.

Senator DOMENICI. Well, tell me which one would be first?

Mr. JARRETT. Well, Senator, the IGCC plants are being proposed—

Senator DOMENICI. Pilots.

Mr. JARRETT [continuing]. Today as we speak. But the coal liquefaction plants, there are proposals or ideas that come to me from across the country in the 2 months that I have been there, and they all have a common problem. We have the technology to produce, to go coal-to-liquids, to produce ultra-clean jet fuel and diesel fuels and other petroleum products out there. But the stumbling block for all of them is financing, and whether it is a \$6 billion plant or—I think the first several will be much more modest than that.

But the problem with all of them is the uncertainty about what is going to happen with world oil prices, because we know that right now—we know we can produce fuel from coal at the low \$40 per barrel equivalent for a first- or second-of-a-kind plant, and that by the time we get to a fourth- or fifth-of-a-kind plant we will have that technology worked so that we can produce fuel at about \$35 a barrel.

But the concern is when you make that kind of a substantial capital investment and then world oil prices were to drop to some number below that. Then you have threatened the financial viability of that plant.

Senator DOMENICI. Can you get straight one last question in my mind, then I am off this issue. I am sorry it took so long. Which is going to come first in these plants that we are going to build? Which commercial consortia or company is going to get the first one and what is it going to be? Coal liquefaction for diesel fuel, is that what it is going to be, diesel and related products?

Mr. JARRETT. I believe that coal-to-liquids and commercial deployment of IGCC plants for producing electricity will happen simultaneous. We know that there are IGCC commercial plants on the drawing boards today.

Senator DOMENICI. And we have within the Department now the facilities to be helpful if the loan guarantee works? That is one instrumentality to help with the financing. And secondly the issue of base price, a bottom line price. If the United States were to adopt a statute establishing a bottom line for the price of crude oil at \$35 right now and said that is going to be it, or \$40, and said we are going to take care of any price that varies from that, that would shake this industry up, would it not?

Mr. JARRETT. My personal view is that would shake the coal-to-liquids industry up in a hurry. But we are having conversations with that industry and asking them the very questions that you are asking right now. That is really as a follow-up to the meeting you and I had not too long ago to talk about those questions.

Mr. GARMAN. My personal view is that IGCC plants will come first, simply because there are folks that know that if they propose to build a pulverized coal plant they will be sued, and they are just looking at IGCC as a cleaner—they will not capture and sequester carbon dioxide, but it will be a cleaner burning plant that is more efficient than a pulverized coal plant.

The interesting thing is that there is a lot of—and I want to make this point. There is a lot of DOE past technology work in this area. These gasifiers—this is a success story for the Department and it is technology that this Department has been involved in and you have been involved in promoting for decades. And finally we are at the threshold of seeing these technologies coming—

Senator DOMENICI. But is it the right thing to happen now?

Mr. GARMAN. I believe it is. I believe it is time for our technologies to enter the market.

Senator DOMENICI. Tell me which one it is going to be, again?

Mr. GARMAN. I think it is going to be integrated gasified combined cycle coal plants that will come into the market.

Senator DOMENICI. What are they going to do with the carbon?

Mr. GARMAN. These first ones will not capture carbon dioxide. They will simply gasify the coal for burning in a turbine and generating electricity. These first plants will not capture carbon dioxide, but they are more efficient than pulverized coal plants.

Senator DOMENICI. Are these not a little more expensive?

Mr. GARMAN. Yes, sir, they are, and that is why they have not been built. Compared to a pulverized coal plant, they are more expensive.

#### GASIFIER TECHNOLOGY

Senator ALLARD. That brings up, Mr. Chairman, a quantitative question I wanted to ask you. How much natural gas can be brought on line with a lot of these technologies? Is there research and testing? Do you have any idea?

Mr. GARMAN. I would have to take that one for the record to give you a good authoritative answer.

[The information follows:]

## GASIFIER TECHNOLOGY

The National Coal Council examined that question and in their March 2006 report to the Secretary: "Coal: America's Energy Future." One of their key findings was that using coal to produce natural gas could provide an alternative to at least 15 percent of America's annual natural gas consumption by 2025, or the equivalent of 4 trillion cubic feet (Tcf) per year. They projected that this additional supply would use an additional 340 million tons of coal per year. This amount of gas is roughly equal to Energy Information Administration's (EIA's) projection of liquefied natural gas imports in 2025.

Currently, the Great Plains Gasification plant in Beulah, ND produces 148 million standard cubic feet per day (54 billion standard cubic annually) of substitute natural gas (SNG) from North Dakota lignite. This plant, which came on line in 1984, uses older fixed-bed gasification technology. The SNG produced in the plant is added into the existing natural gas pipeline network to heat thousands of homes and businesses in the United States. It should be noted that carbon dioxide generated in the process is sent via a 330 km pipeline to Saskatchewan, where it is used for enhanced oil recovery—the Weyburn project. This is one of the Carbon Sequestration Leadership Forum projects which DOE has been sponsoring along with other international participants. This carbon dioxide remains sequestered in the oil field, and therefore this plant provides an early preview of the kind of advanced near zero-emission coal technology we are developing in the DOE coal program.

The technology to produce SNG is commercially available today. The DOE research and development program in coal gasification is focused on the development of advanced technology to reduce cost, improve efficiency, and enhance reliability when used in future near zero-emission coal plants. These developments are also expected to provide significant benefits for plant configurations that produce SNG alone or in conjunction with other products such as electricity.

Senator ALLARD. Okay.

Senator DOMENICI. Senator, I took a lot of time. Do you want to take a little more time?

## ROCKY FLATS LITIGATION CLAIMS

Senator ALLARD. Just one more question. That was one of them, and this fits in here very naturally. This has to do again with Rocky Flats. The former weapons contractors, Dow and Rockwell, and the property owners nearby have been engaged in a protracted legal discussion about whether these property owners will be compensated for damage caused by the environmental contamination at Rocky Flats.

Last February a jury awarded the property owners, in my view an incredible amount of money, over \$550 million in damages. I understand the contractors are now appealing the decision. It seems to me that the only people who are really benefiting from this are the attorneys. They have already collected more than \$100 million in legal fees.

Because Dow and Rockwell now are going to be indemnified by the Federal Government, I guess the real losers are going to be the American taxpayers. To what extent are you involved with this case and do you have any evidence of extensive damage from the operation?

Mr. GARMAN. Because this is a matter in active litigation, I would—and I apologize for doing this—but I would like to take that for the record. I am not a lawyer and it is dangerous for me to comment on issues in active litigation.

[The information follows:]

## ROCKY FLATS MINERAL RIGHTS

The Department of Energy (DOE), in partnership with the U.S. Fish and Wildlife Service (USFWS) and Natural Resources Trustees (Trustees), has established and

is currently executing a plan for purchasing the essential mineral rights at Rocky Flats.

The acquisition strategy for the mineral rights will be conducted in two phases. First, the Trust for Public Lands (TPL), a nonprofit group specializing in real estate acquisitions for Federal Government entities, will purchase the mineral rights from willing owners at fair market value, and will perform any appraisal updates required. In the second phase, these rights will be purchased by the DOE, with the funds provided in the Energy and Water Development Appropriations Act for fiscal year 2006.

At this time, TPL, DOE, and USFWS are finalizing a letter of agreement, stipulating the process for contacting willing sellers and ascertaining fair market values.

DOE and the USFWS fully expect to accomplish the acquisition of mineral rights well within the timeline mandated by Congress, and in harmony with the local stakeholder community.

Senator ALLARD. Well, give us some thoughts, if you would, in response, to the extent that you think you can.

Mr. GARMAN. Yes, sir.

Senator ALLARD. I understand your point on this.

Thank you, Mr. Chairman.

#### LOS ALAMOS NEUTRON SCIENCE CENTER

Senator DOMENICI. Thank you very much.

Dr. Orbach, it is not well known that the Office of Science funds a considerable amount of research at some of the NNSA laboratories, which is the defense nuclear-related laboratories. The Office of Science supports around \$70 million worth of research at Los Alamos, including work at the Neutron Science Center, called LANSCE. That is one of the most powerful linear accelerators in the world. Albeit quite old, it is still one of the most powerful.

As you know, NNSA, the principal sponsor of LANSCE, is considering a major accelerator refurbishment project to secure lifetime extension of the facility. If NNSA goes forward with this project, would the Office of Science continue to support science research at LANSCE?

Dr. ORBACH. Mr. Chairman, yes. The Lujan Center, which is our pulsed neutron center feeding off of LANSCE, has been a very successful exercise in the last few years and we have every intention of continuing that support. It will be a very helpful adjunct to the SNS.

#### ALTERNATE SOURCES OF ENERGY

Senator DOMENICI. The President has made curing our Nation's addiction to oil as a top priority. In fact, the President's statement about that was one of the most exciting things that he said, and also setting a goal for reduction in the amount of oil that we might have to import. That has caused everybody around here to want to double that goal. I am kind of beset by Senators wanting a new law that will do more than that and we are wondering about how we are going to do that.

But one of the—I am aware of the fact that the Department has provided \$40 million to support nuclear energy research and that the Energy Policy Act authorized \$49 million to be used by the Office of Science to support what is called integrated bioenergy R&D with regard to cellulosic biomass. What promising technologies are on the horizon that will enable us to turn corn stalks and wood

waste into ethanol, and what other types of research in your office support the reduction of our use of fossil fuels?

Dr. ORBACH. We have a broad portfolio which ranges from alternate sources of energy through ITER, for example, also through efficiencies, lighter materials and so on, that we think will increase efficiencies and reduce consumption of energy. But to be very direct, we also believe that our programs that involve genomics, genomics GTL, will address the bioenergy opportunities directly. We have a commitment to expand and create new research centers for bioenergy that will be focused on cellulosic ethanol.

In addition, we have every reason to believe that we can mimic nature's structures in photosynthesis to go from solar to fuels, as well of course as photovoltaics. So we are examining a wide variety of really transformational approaches to reducing our dependency on oil.

#### INTERNATIONAL LINEAR COLLIDER

Senator DOMENICI. I have a number of questions about the genome program, the genome project that you have got going, but I think I am going to submit them. They require a very long introduction to the question and I do not want to take that much time.

But I want to move to a rather interesting subject matter, at least between you and me. Perhaps nobody else in the world cares. It relates to the International Linear Collider. This year the—no, I am not going to do that one either. I am going to give you that one to answer, okay.

I am going to talk with you a little about the Linear No Threshold Standard. Have you got that, Linear No Threshold Standard. Last year we discussed this Linear No Threshold Model research that the Department was assembling. I understand that there is a French study that was published last year that challenged the validity of the Linear No Threshold model that we were putting together. The effect—all of this has to do with the effect of low dose radiation, and the French study urged a total reevaluation of this model.

Am I correct so far?

Dr. ORBACH. Yes, you are, sir.

Senator DOMENICI. As it applied to low doses of ionized radiation, below 10 rems. Now, first let us stop for a minute. Regardless of whether there is any big application to this subject or not, what does "10 rems" mean?

Dr. ORBACH. It is a measure of the effect on biological material of radiation, either alpha or gamma radiation, and the energy deposited in the material itself. The energy deposited is measured in terms of rads. It is in ergs per gram. Then that is converted to rems to take account of the fact that the different kinds of radiation have different effects on the biological material.

Ten rems is our maximum for what we call low dose radiation.

Senator DOMENICI. So if we are trying to say you can use something that is dispensing with radiological material that is going to let that get out, we have a standard that says it is safe if it is 10 or under; is that what you are saying?

Dr. ORBACH. No, our standards are actually much lower than that.

Senator DOMENICI. Okay, tell me about it?

Dr. ORBACH. The epidemiology research that we have seen does not show significant or any cancerous effects for radiation of 10 rems or less. But the actual amounts of radiation that are used as our standards are orders of magnitude lower than that value.

Senator DOMENICI. But it is an attempt at quantifying?

Dr. ORBACH. Yes. Our program is completely consistent with the French observations and we are now, I believe, at a point where we can work with the EPA to begin to reassess the radiation risks that low dose radiation might involve.

Senator DOMENICI. We jumped ahead here. I was trying to get here on the record how various people in their daily lives are exposed. So I get in an airplane tonight in New York and I fly all the way across the continent to Los Angeles. I am exposed to radiation, right?

Dr. ORBACH. That is correct.

Senator DOMENICI. And it is different than the radiation that I am going to be exposed to if I stand on the ground here, certainly at sea level. And I fly all the way across and I get exposed to radiation, but nobody thinks there is anything wrong with that, right?

Dr. ORBACH. That is correct.

Senator DOMENICI. How much am I exposed to when I fly?

Dr. ORBACH. My memory is about 10 millirems. That is—the round trip I took from New York to London, is of the order of 10 millirems, which would be a hundredth of a rem or a thousandth of the 10 rems.

Senator DOMENICI. Okay. And you did it round trip, it is double?

Dr. ORBACH. Yes.

Senator DOMENICI. Now, let us proceed. The reevaluation of this model that I had gotten to and then we got sidetracked, the model applies to low doses. This is significant for a variety of reasons. But the most significant is that we base all our standards and regulations on levels far below 10 rems; correct statement?

Dr. ORBACH. That is correct.

Senator DOMENICI. In fact, we set our cleanup levels which we just referred to over here for Colorado's cleanup, we set those standards for cleanup levels at levels below 10 and some cleanup levels are under 20 millirems, which you have just described how much smaller that is, far below the natural background of between 200 and 400 millirems.

Dr. ORBACH. That is correct.

Senator DOMENICI. Is this study consistent with the data that the Department has collected under the Linear No Threshold Standard, and are we confident that the conclusion will change current regulations based on science if it is flawed?

Dr. ORBACH. We are convinced that the Linear No Threshold Model is incorrect at the low dosages of 10 rems or less. We are convinced that the scientific data has accumulated, certainly in recent years, to require a reevaluation of the risk of low dose and especially low dose rate radiation, and we are convinced that the epidemiology at 10 rems or less needs to be investigated to determine whether there is any evidence of cancerous consequences.

Senator DOMENICI. How much resistance are you getting and from whom for this rather dramatic statement that you are making here?

Dr. ORBACH. Well, first of all, we do our own research, thanks to the support of this committee and the appropriations over the last 5 years. So our peer-reviewed research projects that are done by researchers all over our country have been accumulating, especially in recent years, to enable me to make this statement.

But then last spring a remarkable set of documents emerged from the French Academies of Science. The French Academy of Science and the French Institute—the French Academy of Nuclear—sorry—of Medical Research published a joint statement which was consistent with our own research findings and in fact made categorical remarks that the Linear No Threshold Model is not based on evidence that exists in the literature today at low dosage.

Senator DOMENICI. We might one day have a half day hearing on what this means, what it could mean.

Dr. ORBACH. I would be pleased to put such a hearing together.

Senator DOMENICI. If this is applied, the reduction in the cost to society could be in the hundreds of billions of dollars over time because we are wasting money protecting ourselves from what we are now told needs no protection. Am I reading it right?

Dr. ORBACH. I would agree. I would agree with that conclusion.

#### HYDROGEN POWERED FUEL CELLS

Senator DOMENICI. Mr. Secretary, one of the major elements of the bill that we passed, title VIII, was a road map that included revised funding and milestones for the development of hydrogen and fuel cells under the freedom car and the fuel partnership. Can you locate that in your mind or in your recollection, material there? The provision as a result of extensive collaboration between hydrogen and fuel stakeholders and policymakers, in which the research and development needs of the DOE and the industries that were participating were extensively evaluated. I think you might have even been a party to that.

Section 8 reflects Congress' determined will that we wanted the President's 2010 and 2015 goals for hydrogen-powered fuel cells. Can you discuss how the statutory directives of EAct 2005 figured in the 2007 budget and can you tell us how DOE plans to meet these goals?

Mr. GARMAN. The statutory requirements in the Energy Policy Act comport very, very closely, almost precisely, with our road mapping plan and our long-term and short-term program plans. We have fallen behind in some areas. Our overall goal is still on track. Our goal is to be able to put industry in a position to make a commercialization decision with the technical barriers solved by 2015.

Because of some shortfalls in appropriations and congressionally directed spending, we have let some aspects slip. Last year I think we got about 60 percent of our request—

Senator DOMENICI. I have to excuse myself. I have a phone call here. There is nobody else here, so do not talk.

It looks like that was a most opportunistic moment in time. Others had to leave also. Now we are going to take just 5 more minutes and give you about 100 questions to answer.

Mr. GARMAN. Okay. I will keep the answers very brief then.

Senator DOMENICI. Okay. Finish that answer.

Mr. GARMAN. We have had some programs and some projects slip, but not to the extent that we are moving away from our 2015 goal.

Senator DOMENICI. You mentioned in that statement that part of that problem was because of budget shortfalls. I would assume that there are some technological problems along with it, or is it all money?

Mr. GARMAN. Well, there are some technical challenges that confront us in achieving the full-blown hydrogen vision, and I will just illustrate one and it is another illustration of how we think the Office of Science can be helpful. One of the most challenging aspects of the program is carrying enough hydrogen on board a fuel cell vehicle to give that vehicle the kind of range that a consumer expects, 300, 350 miles.

Today, with current technology the fuel cell vehicles that we have on the road go about 150 miles. That will not fly with the consumer. So we are looking at a variety of different technologies, perhaps involving metal hydrides, carbon nanotubes, a variety of different materials and structures that could hold a lot more hydrogen in a manner that is closer to ambient temperatures and pressures, so that you do not have to use high pressure tanks and some of the other things that, frankly, might be of concern to a consumer.

Just last week in SLAC, I was able to see some work that was being done there to look at how to stack more hydrogen in the carbon nanostructures so that, instead of going to a conventional fueling station the way we do today, you just might pick up a canister of hydrogen-impregnated carbon at Wal-Mart and stick that in your car and that would be your fuel.

So there are all kinds of novel ideas and approaches that we are looking at. Our partners, such as General Motors and Ballard and others, have been doing some very good work. This money is being well leveraged in my view with private sector dollars in achieving these goals.

#### YUCCA MOUNTAIN LICENSE APPLICATION

Senator DOMENICI. The last question has to do with the Yucca Mountain license application. Secretary Bodman testified that the Department anticipates providing a new schedule for license application and repository operations by early summer. The budget justification material indicates among the tasks to be accomplished in the 2007 budget is defending the license application before the NRC.

My question is twofold. Does the budget request assume that a license application will occur in 2007 and, if not, would the request need to be adjusted? And second, what is the Department's current estimate for the cost of the rail line to Yucca Mountain?

Mr. GARMAN. We do not expect to be in a position to submit a license to the NRC in fiscal year 2007, and we will submit some

materials. Of course, obviously when our schedule later this summer is there we will try to lay it out for you as clearly as we can.

The cost of the rail line is highly variable based on the final routing and of course the cost of steel, which lately is accelerating. But it could be a \$2 billion railroad.

Senator DOMENICI. Two billion dollars?

Mr. GARMAN. Yes, sir, it could.

#### ADDITIONAL COMMITTEE QUESTIONS

Senator DOMENICI. If it could, it probably will. If it could, it probably will be more.

In any event, I am sorry we cannot go on. We have many more questions. Your testimony will be reviewed and we will have some questions on how we might adjust some dollars to accomplish some of the things you could not do. I want to close by commending you once again, you and all of the staff that is here with you, for your hard work, and thanks for your patience today.

[The following questions were not asked at the hearing, but were submitted to the Department for response subsequent to the hearing:]

#### QUESTIONS SUBMITTED BY SENATOR PETE V. DOMENICI

##### GENOMES TO LIFE PROGRAM

*Question.* Dr. Orbach, as you know, genomics research has been a top priority of mine for some time. I am very proud that the Department of Energy took the lead in mapping the human genome. This knowledge provides us the opportunity to understand many biological questions. I am very supportive of the Genomes to Life program, although I am frustrated with the slow pace of deployment of the four facilities. I believe 20 years is too long to wait to integrate the four planned facilities.

I understand the National Research Council has reviewed the Department's current plan and they have made several recommendations to accelerate the implementation of genomics research within the Department. The National Academies has suggested the Department consider integrating the capabilities of each of the four facilities into one facility to address one or two Department core missions such as bio-energy or carbon sequestration. I believe this report has made good recommendations that will save the Department time and money and allow research to begin immediately.

Dr. Orbach, what do you think of these recommendations? Do you believe the Department will realize the same scientific benefit by integrating the four facilities into one?

*Answer.* The National Academies report was an excellent report. Its recommendations played a key role, along with the announcement of the President's Advanced Energy Initiative, in our recent decision to recast plans for the GTL facilities. The Department believes that the new facilities plan for vertically integrated centers focused on bio-energy research, based partly on recommendations from the NRC panel, should indeed be able to accomplish the GTL program's objectives more rapidly and at reduced cost.

*Question.* The Department has already issued a Request for Proposals on the first of four buildings. In light of this report, will you cancel the RFP and reissue an RFP based on these recommendations?

*Answer.* On March 28, 2006, the Office of Science cancelled its Funding Opportunity Announcement (FOA) for a planned GTL Facility for the Production and Characterization of Proteins and Molecular Tags, issued in early January. The Office of Science plans to issue a new solicitation in the coming months for one or more centers for bio-energy research. Centers focused on systems biology research into carbon sequestration and bioremediation are also being considered for future years.

*Question.* The Academies recommended the Department pursue one or two core missions and support research into bio-energy, environmental cleanup and carbon sequestration. What grand challenge do you believe is the highest research priority?

Answer. In response to the President's Advanced Energy Initiative's mandate for a strong focus on bio-energy, with an emphasis on producing research results that will help reduce the Nation's dependence on fossil fuel, GTL's energy mission is the highest research priority.

LOS ALAMOS NEUTRON SCIENCE CENTER

*Question.* Dr. Orbach, It is not well known that the Office of Science funds a considerable amount of research at some of the NNSA laboratories. The Office of Science supports around \$70 million worth of research at Los Alamos, including work at the Los Alamos Neutron Science Center, (LANSCE), one of the most powerful linear accelerators in the world.

As you know, the NNSA, the principal sponsor of LANSCE is considering a major accelerator refurbishment project to secure a significant lifetime extension of the facility.

If NNSA goes forward with this project, would the Office of Science continue to support scientific research at LANSCE?

Answer. The Office of Science would likely continue to support merit-based scientific research at LANSCE, particularly at the Manuel Lujan Jr. Neutron Scattering Center.

SCIENCE AND ENERGY RESEARCH

*Question.* Dr. Orbach, the President has made curing our Nation's addiction to oil a top priority. I am aware of the fact that the Department has provided \$40 million to support nuclear energy research. Also the Energy Policy Act authorized \$49 million to be used by the Office of Science to support integrated bio-energy R&D.

With regard to cellulosic biomass, what promising technologies are on the horizon that will enable us to turn cornstalks and wood waste into ethanol?

Answer. We believe that our efforts in the GTL program to harness the powers of the microbial world hold the key to making the production of cellulosic ethanol cost-effective on a large scale. Advances in GTL genomics and systems biology approaches offer potential for improving the enzyme systems that deconstruct plant cell walls and increasing the yield of ethanol-producing microorganisms. In addition, systems biology potentially provides powerful tools for enhancing the productivity of biomass crops by optimizing them for industrial processing.

*Question.* What other type of research is your office supporting to reduce our usage of fossil fuels?

Answer. In energy supply, the Office of Science is funding fusion energy research, which holds the promise of an economic, environmentally benign energy source. We are also funding research in solar to fuels in which we will try to mimic photosynthetic processes in plants. To reduce energy consumption, we fund combustion research to improve combustion efficiency; research to create lightweight, high-strength materials that improve efficiency; research into materials for transportation, storage and use of hydrogen; and high-performance computers that reduce the time-to-market for new, efficient engine designs (virtual prototypes) and can lead to airframe and vehicle designs that improve aerodynamics.

LINEAR-NO-THRESHOLD STANDARD

*Question.* Dr. Orbach, last year we discussed the linear-no-threshold model research the Department is assembling. I understand a French study was published last year that challenged the validity of the Linear-No-Threshold model in assessing the effect of low dose radiation and urged the re-evaluation of this model as it applies to low doses of ionizing radiation below 10 rem. This is significant for a variety of reasons, but the most significant is that we base all of our standards and regulations on levels far below 10 rem. In fact we set our cleanup levels at under 20 millirems—far below the natural background of between 200–400 millirems.

Is this study consistent with the data the Department has collected on the Linear-No-Threshold standard?

Answer. Yes, the French Report is consistent with much of the data coming from the DOE Low Dose Program. The new data does not support a linear extrapolation to low doses for cancer risk.

*Question.* If you are confident of these conclusions how will this change current regulations that are based on a flawed scientific model?

Answer. Our understanding of the biological responses to low dose radiation exposure has increased dramatically. The new data directly challenge major underlying assumptions originally employed when the task of estimating human health risk for low dose exposures was first attempted, primarily using A-bomb survival data. I believe that the scientific community will rethink risk estimation in light of the newer

more biologically rigorous assumptions. At the same time, more attention will be paid to more relevant epidemiological studies of low chronic exposures that mostly show no excess cancers. In the end, EPA and other regulatory agencies which have the lead on setting regulations will use these new scientific data provided by DOE's Office of Science and others.

#### JOINT DARK ENERGY MISSION

*Question.* Dr. Orbach, you have consistently argued to sustain our scientific leadership in areas where we can and should be the world leaders. Unfortunately, I fear we are about to lose our leadership in an area where the United States has assembled the best scientific minds and maintain the most capable space program. I am referring to the joint DOE/NASA Joint Dark Energy Mission which is supported by the Office of High Energy Physics and ranked as No. 3 on the 20-year Scientific Technology Roadmap. This project will investigate the universe to understand the most fundamental questions about energy, space and time. In order to fully realize its scientific value we must launch a space-based telescope.

Unfortunately, insufficient funding for this program puts in jeopardy the program and is likely to result in other countries picking off the assembled scientific and engineering talent.

Despite the fact that this project was ranked No. 3 in the Department's 20-year plan, this project seems to have lost favor within the Department and NASA. Why is that? Why isn't the Department fighting to maintain this world-class scientific capability?

*Answer.* The Joint Dark Energy Mission (JDEM) remains a high priority in the Office of Science. In fact, funding for competitively-awarded dark energy R&D goes up over three-fold in the fiscal year 2007 President's request. We continue to have discussions with NASA on how best to move forward on an interagency basis on JDEM. In February 2005, two interagency Federal advisory committees of DOE, NASA, and the National Science Foundation established a Dark Energy Task Force as a joint subcommittee to advise the agencies on the future of dark energy research on the ground and in space. The final task force report should be released in May 2006 and we expect that our path forward on dark energy studies broadly, and JDEM in particular, could be significantly impacted by the recommendations of this distinguished panel.

*Question.* How will the Department support the JDEM program as well as other large projects, including the work on neutrino detection and the Large Hadron Collider?

*Answer.* We believe the SC budget request will adequately support the JDEM mission as well as other large projects, including the work on neutrino detection and the Large Hadron Collider (LHC). As you may know, the just-released National Academies report on the future of particle physics in the United States, "Revealing the Hidden Nature of Space and Time: Charting the Course for Elementary Particle Physics", recommends that our highest priority should be supporting our LHC research program, followed by R&D on the proposed International Linear Collider, and then research including dark energy and neutrinos.

*Question.* NASA has indicated that a re-plan of the Beyond Einstein program, which supports the JDEM program, will be conducted in fiscal year 2008-2009 to determine mission need. This would effectively kill any opportunity for a space launch for a telescope to support this research. Do you agree with this assessment?

*Answer.* We had discussions with NASA on this, and we understand NASA will have a competition between the Constellation X-Ray Observatory (Con-X), Laser Interferometer Space Antenna (LISA), and JDEM missions to decide which one could start about 2010. Thus, we believe there is still the opportunity for a joint DOE-NASA JDEM mission.

*Question.* Why isn't NASA supportive of this mission? Has this changed the Department's view of this project?

*Answer.* We understand that JDEM remains an important part of the NASA Beyond-Einstein program but they are limited by funding to only moving one of the three missions (Con-X, LISA and JDEM) forward. DOE and NASA both are currently supporting mission concept studies. DOE's view of JDEM has not changed, and we support the JDEM mission.

*Question.* If NASA isn't supportive of this mission why isn't this reflected in the budget justification?

*Answer.* NASA is supportive of the mission and will be doing a competition between Con-X, LISA and JDEM in the 2008-2009 timeframe to decide which of the three will go forward about 2010. Both NASA and DOE are currently funding mission concept studies.

*Question.* How much would it cost for the Department to take over this project and fund the space launch without financial support from NASA?

*Answer.* An extremely crude early cost estimate for the full JDEM mission and launch is somewhere in the range of \$600 million to well over \$1 billion, but we would need to carry out a thorough mission concept competition and scientific and technical reviews before proceeding to a more mature cost estimate. We also expect that the soon-to-be-released dark energy task force report (mentioned above) could necessitate a re-evaluation of the optimal path forward including the appropriate scope and scale of JDEM.

#### INTERNATIONAL LINEAR COLLIDER

*Question.* This year, the Large Hadron Collider located in CERN will come on-line supporting high energy physics research. In fiscal year 2007, the DOE will fulfill its funding obligation of \$450 million of the \$6 billion project.

The budget request includes a request of \$60 million, an increase of \$30 million to support the United States R&D effort to build the next generation collider to replace the LHC, which will initiate operations this year. The budget justification also supports construction studies and siting studies. I understand cost estimates for this next generation machine begin at \$7 billion.

Why is the United States rushing to support the next generation machine, before the existing state-of-the-art facility has begun operations? When does the Department hope to break ground on this new machine and where?

*Answer.* The International Linear Collider (ILC) and the LHC are synergistic from a scientific standpoint. Simply put, the LHC can discover that new phenomena exist and the ILC will tell us what they are and what they mean. It will likely take another 5 years of R&D before we are technically ready to proceed with construction of the ILC, should the decision be made in the affirmative on a domestic and international basis. The current phase of the ILC is an internationally planned and coordinated program of R&D that should result in technical demonstrations of all major system components over the next several years. Our domestic decision process for the construction phase rests primarily on this R&D, the technical cost estimate from the Global Design Effort, and on compelling scientific results from the early LHC program. The next phase for the ILC would then be a thorough multilateral international decision process, ultimately including a competitive site-selection process, allocation of roles and responsibilities, and so on. It is therefore premature for the Department to hazard a guess on when the project could break ground. Our current position is that Fermilab would likely be the optimal site within the United States.

*Question.* How much does the Department expect the International Linear Collider to cost and what are the cost share arrangements with other countries? Is there a cost the Department believes is too much for this facility?

*Answer.* We await the Global Design Effort, under Professor Barry Barish, to report a credible cost estimate early next calendar year. Based on the ITER fusion project, it would be reasonable to expect that the host State would shoulder 50 percent of the cost.

*Question.* Does the Department intend to compete the siting of this new facility among U.S. institutions?

*Answer.* Our current position is that Fermilab would likely be the optimal site within the United States. The management and operation contract for Fermilab will continue to be open for prudent and necessary competition.

*Question.* Where does this facility rank in the Department's 20-year plan?

*Answer.* ILC ranks No. 1 in the mid-term epoch.

#### OFFICE OF SCIENCE—20-YEAR PLAN

*Question.* Dr. Orbach, in November 2003, the Department put forward a 20-year plan entitled "Facilities for the Future of Science, a Twenty-Year Outlook" This report identified the facilities and mission that the Department wanted to pursue in near-, mid- and long-term. The selections were reviewed and prioritized by an Office of Science Advisory Committee. One argument for this facility was that it would establish priorities with clear goals that would help with balancing budget priorities and adhere to scientific priorities. One of the facilities identified in the plan was the Rare Isotope Accelerator, listed as the third priority and a near-term goal. This project apparently has been bumped another 5 years into the mid-term.

Is this project an exception and will the Department continue to follow the 20-year plan implemented just a little over 2 years ago?

*Answer.* Achieving an optimal balance among the many competing priorities for science funding is a formidable challenge. We devote substantial effort to achieving

this task. Our 2003 publication “Facilities for the Future of Science, A Twenty-Year Outlook” marked the first time, to my knowledge, that any government agency either here or abroad publicly issued such a long-range planning document on major scientific facilities. The Facilities publication culminated many months of careful deliberation that consolidated a list of 53 prospective facilities into a list of 28. The Facilities document prioritized the 28 on the basis of “Importance to Science”, grouped into three “epochs” on the basis of “Readiness for Construction.” These epochs are Near-Term, Mid-Term, and Far-Term, spanning the 20 years. Priorities should be thought of as internal to the respective epoch. Comparison of priorities between epochs would be incorrect.

The purpose of this construction was to recognize that technologies change, and that the determination of which epoch a particular facility fell into might well change with time. The introduction to the document states, in fact: “We know, however, that science changes. Discoveries will alter the course of research and so the facilities needed in the future. For this reason, the ‘Facilities for the Future of Science: A Twenty-Year Outlook’ should be assessed periodically in light of the evolving state of science and technology.”

Thus, overall, the facilities identified and the priorities set in the facilities outlook remain valid. Our prioritization among epochs, however, has changed because we could not predict precisely how quickly various technologies would develop.

*Question.* Have any of the other projects changed in their position on the list? If so, why?

*Answer.* Yes, the elimination of BTeV last year because it was determined that it could not be completed in time to provide meaningful results before the Large Hadron Collider starts taking data. And the top priority within the Far-Term epoch, the National Synchrotron Light Source Upgrade (NSLS II), was placed in that epoch because, at the time the facilities outlook was written, it was thought that the technology would not be ready for construction for some years. But the technology developed more quickly than anticipated, and NSLS II should now be regarded as in the Near-Term epoch.

#### TECHNOLOGY TRANSFER COORDINATOR

*Question.* The Energy Policy Act of 2005 created the position of a Technology Transfer Coordinator. The Coordinator is meant to focus the Department’s efforts to transition energy technologies developed at the National Laboratories into the marketplace. The Act also establishes an Energy Technology Commercialization Fund, using a 0.9 percent set-aside of funds used for applied energy research and development. I understand the Department has not yet acted to comply with these requirements.

Has the Department determined which Under Secretary will have responsibility for enacting these provisions?

*Answer.* The Department is studying this provision of EAct and will report back to you when a determination is made.

*Question.* Since the Office of Science oversees a larger number of National Laboratories than any other office within the Department, should the Technology Transfer Coordinator report to the Under Secretary of Science?

*Answer.* Once the Department has concluded its assessment of the EAct provisions, the Secretary will make a determination whether the Technology Transfer Coordinator will report to the Under Secretary for Science.

*Question.* The provision creating the Energy Technology Commercialization Fund applies to the current fiscal year. Will the Department be able to account for the use of the funds set-aside for the fund for fiscal year 2006?

*Answer.* The Department is still assessing this provision and will respond once the assessment is complete.

*Question.* The same section of the Act requires the Department to submit a technology transfer execution plan. What is the status of the Department’s efforts to develop this plan?

*Answer.* The Department is still working on the technology transfer execution plan.

#### INDEPENDENTLY FINANCED FACILITIES

*Question.* Dr. Orbach, I understand that DOE is trying to address aging infrastructure crucial for science at DOE and NNSA laboratories through alternative financing such as the use of private third-party financing without the upfront cost to the Federal Government.

What are the DOE plans for supporting and promoting third-party financing, and what are the obstacles faced when initiating projects such as the Science Complex at Los Alamos National Laboratory?

Answer. The Department's approach to alternative financing is to consider it in the acquisition strategy phase of proposed new shorter-term projects. The acquisition strategy is developed after the mission need is approved. If alternative financing is recommended, then a business case must be provided that supports this recommendation. General-purpose type facilities with credible private-sector uses (e.g., office buildings) are usually best-suited for alternative financing.

Each opportunity is unique and the Department reviews each opportunity individually based on its merits. It is not appropriate for me to address opportunities that may be under consideration at Los Alamos because the facility is under the stewardship of the National Nuclear Security Administration.

#### RARE ISOTOPE ACCELERATOR

*Question.* The Nuclear Science Advisory Committee was charged in 2003 to compare the capabilities of the proposed Rare Isotope Accelerator (RIA) and the planned GSI facility in Germany. The committee concluded that RIA and the GSI were designed for different purposes and that each would serve large and distinct user communities.

Does the Department accept the committee's conclusion that RIA and the GSI are not duplicative? If not, what is the reason for disagreement with the NSAC assessment?

Answer. The NSAC assessment found that RIA's rare isotope research capabilities were more extensive than those of GSI. The Department accepts these findings.

#### INDIA'S INCLUSION IN ITER

*Question.* At the December negotiations to complete the international agreement on ITER, the delegations welcomed India as a full party. With this development, I understand that the parties to ITER now constitute over half of the world's population.

How will the inclusion of India as a full partner in ITER alter U.S. financial commitments to the project?

Answer. The joining of India has not reduced the overall contributions of the other parties, but within those contributions it has enabled each of the Parties to provide an appropriate funding contingency to cover unanticipated costs of the ITER Organization, the legal entity responsible for oversight of the construction, assembly, operation, and deactivation of the facility.

*Question.* How will the inclusion of India as a full partner in ITER alter U.S. prospects for the development of new technologies likely result in valuable intellectual property?

Answer. In order for India to be a full partner, the allocation of in-kind hardware contributions was renegotiated among the ITER parties. The European Union, China, Japan, Korea, Russia, and the United States adjusted their high- and lower-tech contributions so that India's allocation would also be such a mix. The United States will still be providing significant amounts of high-tech hardware with the potential to develop valuable intellectual property.

#### EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH

*Question.* The Experimental Program to Stimulate Competitive Research (EPSCoR) supports basic research in States that have historically received relatively less Federal research funding, in particular for University research. EPSCoR funding has been flat in recent years, at about \$8 million. Under the President's American Competitiveness Initiative, Office of Science funding will double over the next decade.

Do you anticipate that EPSCoR funding will remain a constant fraction of the overall Office of Science budget, as the total budget increases?

Answer. Yes, EPSCoR funding will at a minimum remain a constant fraction of SC budget.

#### STANDBY SUPPORT FOR NUCLEAR POWER PLANTS

*Question.* The Energy Policy Act of 2005, Section 638 authorized the Department to implement "risk assurance" as a protection against regulatory delays and litigation. This provision provides a \$500 million guarantee for the first two plants.

How does the Department intend to implement this provision?

Answer. Consistent with EPAct, the Department is developing a rulemaking to provide the procedures and process for implementation of the standby support provisions in Section 638, otherwise referred to as Federal risk insurance. The Department is on target to meet the deadlines established in the legislation and to issue the interim final rule by May 6, 2006. The rulemaking is expected to be final by the legislative deadline of August 2006.

*Question.* EPAct authorized the use of both grant funding and loan guarantees, both requiring an appropriation. When will the Department budget funds to support this activity?

Answer. The Department is currently evaluating the timing and appropriate funding from both grant funding and loan guarantees under EPAct.

#### NUCLEAR POWER R&D

*Question.* The President has made nuclear power a top priority in this budget providing \$250 million toward the GNEP program, which largely funds advanced fuel cycle activities. This large funding commitment seems to contrast with reductions in the Nuclear Power 2010, which seeks to support the deployment of new, safer reactors. It also runs counter to funding increases for the Nuclear Regulatory Commission, which is preparing to review license applications developed under the NP2010 program.

Will the Department be able to fully support all the proposed combined operating license applications with this level of funding?

Answer. Yes. The Nuclear Power 2010 program remains a top Departmental priority. The requested level of funding will fully support the originally planned proposed combined operating license application work scope for fiscal year 2007. The requested funding is based on the scope of the work negotiated with the industry in fiscal year 2005, when the New Plant Licensing Demonstration projects were initiated. The award of the cooperative agreements was later than expected, and there has been a slower-than-expected ramp-up of activities. As a result, the NP2010 program costs have lagged behind our obligated funding resulting in carry over from fiscal year 2005 into this fiscal year. With the unexpected additional appropriations in fiscal year 2006, the NP2010 program anticipates carryover into fiscal year 2007 that combined with the budget request will support the originally-planned work scope.

#### IMPLEMENTATION OF THE ENERGY POLICY ACT

*Question.* Mr. Garman, EPAct provided a broad authority to the Department to support R&D, but also sought to support the deployment and technology validation of specific alternative energy such as biomass, clean coal technology, and solar, as well as others. Unfortunately, there are a number of demonstration activities, including Title 15, "Ethanol and Motor Fuels" that didn't receive any funding even though Congress authorized over \$800 million for grants and other cost sharing arrangements to encourage the commercialization of biomass conversion technology.

Can you please explain how and when the Department intends to support the Biomass-to-Ethanol programs in Title 15?

Answer. Our biomass program currently supports the goals of Title 15 through investments in advanced technologies that will augment biofuels production at existing corn wet and dry mills. The program also fosters the development of the next generation biorefinery for the production of fuels, power, and commodity chemicals from a wide variety of feedstocks including the conventional grain crops as well as perennial grasses and wood and forest residues.

As noted in the Statement of Administration Policy (SAP) submitted to energy bill conferees on July 17, 2005, "The House and Senate versions of H.R. 6 also include authorization levels that in many cases significantly exceed the President's Budget. These authorizations set unrealistic targets and expectations for future program-funding decisions." House and Senate SAPs contained similar language.

The Department prioritized activities, including those authorized under EPAct, that would most contribute to the goal of reducing America's growing dependence on foreign oil. The 2007 budget reflects the Department's priorities.

*Question.* Section 942 also provided production incentives for cellulosic biofuels. This activity hasn't been funded either. Can you update me on the status of this provision and if the Department will provide any funding in the near future? Also, is the Department preparing regulations to support this program?

Answer. Section 942 authorizes the Secretary to use a reverse auction to deliver the first billion gallons in annual cellulosic biofuels production by 2015. The use of this authorization is timed to the first year that 100 million gallons of cellulosic biofuels are produced in the United States or in August of 2008. We are reviewing

the requirements for this program and determining what regulations will be required and the schedule for such requirements.

CLEAN COAL POWER INITIATIVE

*Question.* The budget provides just \$5 million toward the Clean Coal Power Initiative, down \$45 million from the current year levels. This program supports the deployment of clean coal technology including Integrated Gasification Combine Cycle (IGCC) facilities, which have the potential to significantly reduce greenhouse gas emissions. Historically, the Department wouldn't go forward with a technology solicitation without having secured at least \$200 million. At this point, there is roughly \$50 million available for fiscal year 2006.

What is the rationale for cutting clean coal research at this point?

*Answer.* The fiscal year 2007 funding request of \$5 million will be combined with that from prior appropriations and will go towards the accumulation of funds for a future CCPI solicitation. In addition, if other clean coal projects do not go forward, then any additional funding that becomes available will also be applied towards a future CCPI solicitation. Ongoing CCPI projects, FutureGen, and various tax incentives including those authorized in the Energy Policy Act of 2005 continue to provide incentives for demonstration and deployment of clean coal technologies with the potential to significantly reduce greenhouse gas emissions.

The budget reduces the addition of new funds to CCPI, so that the program can take steps to improve the use of funds already provided for projects. As identified in the Program Assessment Rating Tool (PART) review, delays in CCPI ongoing projects and selected projects still in negotiation have contributed to high unobligated balances, currently over \$500 million. This is partially a result of lengthy negotiations due to the complexity of the projects and statutory requirements to provide full funding to projects. In addition, extended negotiations over contract terms, private sector difficulty securing adequate financing for their cost share, private sector difficulty obtaining permits, and other issues have led to significant unobligated balances tied to projects or independent components of projects that were selected several years ago and have not begun construction.

Although some degree of unobligated balances are expected, and in fact necessary, for forward funded, large scale, long duration, demonstration projects, the program also sees unobligated balances tied up in projects that are not moving forward to achieve CCPI's goals expeditiously and are delaying the benefit of funds appropriated for CCPI. The program is working to reduce the time between selection and award for projects that are being negotiated for initiation, and the time for those projects already awarded but requiring negotiated agreements to go to the next budget phase for which funding will be obligated. The goal of these improvements in the CCPI process is to ensure that projects progress to commencement of construction in a timely manner and strengthen the Department's ability to withdraw funding from stalled projects. If a project does not go forward or continue to the next budget phase, the available funds will be put towards a future CCPI solicitation. The program is also working to develop processes to ensure consistency of project selection with the R&D Investment Criteria and improve contract and project management controls to achieve the desired results.

*Question.* When do you envision the next technology solicitation?

*Answer.* The fiscal year 2007 request for the Clean Coal Power Initiative (CCPI) of \$5 million, along with funds from the prior appropriations, will make available approximately \$80 million that could go towards the accumulation of funds for a future CCPI solicitation. In addition, if other clean coal projects do not go forward, then any additional prior year clean coal funding that becomes available will also be applied towards the funding for a future CCPI solicitation. The decision of when to issue a CCPI solicitation will be made in the context of annual budget formulation and will be influenced by steps the program is currently taking to improve the use of funds already provided for projects and availability of prior year funds from projects that may not go forward.

*Question.* The Secretary has previously testified that there is a large amount of uncommitted funds within this account—can you please provide more specific details of this funding and if any of those funds can be rescinded?

*Answer.* By uncommitted funds the reference is to the fact that the funds have not yet been obligated for some of the competitively selected projects. When funds are obligated, they are committed to a particular contract. However, there is a commitment to fund those selected projects that currently are in negotiations to either be awarded for start-up or to continue to the next budget phase. Obligations of funds to the projects are done on a budget phase basis after the project has been

negotiated and awarded. As such there is a funding commitment, but not a contractual funding obligation, tied to the projects.

Lengthy negotiations due to the complexity of the projects, statutory requirements to provide full funding to projects, and long lead time acquisition of components have resulted in approximately \$480 million in unobligated balances for projects in CCPI and its predecessor programs (Power Plant Improvement Initiative and Clean Coal Technology Demonstration Program) that were awarded in the last 2 years and have not yet started and projects that were awarded up to 3 years ago and are currently making progress towards construction or are under construction. In addition, extended negotiations over contract terms, private sector difficulty securing adequate financing for their cost-share, private sector difficulty obtaining permits, and other issues have led to approximately \$195 million in unobligated balances for projects or independent components of projects that were awarded 3, 4, and 13 years ago, and have not yet started. If for some reason, a project does not go forward, the funding would be made available for a future CCPI solicitation.

#### GNEP

*Question.* Secretary Garman, as I have stated previously, I am very encouraged by the Department's new energy initiatives, especially the Global Nuclear Energy Partnership (GNEP). This is an ambitious program that will have significant impacts on the energy security of the Nation. Over the years the DOE has invested in nuclear research that can have a direct impact on new nuclear fuels and solve the problem of large volumes of nuclear waste that could contribute to the proliferation of nuclear weapons.

I am anxious to see the next level of detail from the Department on how the funds will be spent in fiscal year 2007, in particular what roles will be assigned to what national laboratories.

Can you tell me how DOE and GNEP will tap into the expertise resident in the NNSA laboratories and when this committee should expect to see the details of the work distribution?

*Answer.* While Idaho National Laboratory currently is the lead laboratory for the advanced Fuel Cycle Initiative, the participation by and capabilities of all of DOE's national laboratories will be critical to the success of GNEP. The seven national laboratories—Argonne, Los Alamos, Lawrence Livermore, Sandia, Oak Ridge, Pacific Northwest, and Idaho—have provided input into the Department's development of and vision for GNEP. These seven national laboratories are also currently involved in the preparation of more detailed work scope and funding requirements. The details of the work distribution would be available to the committee after careful consideration and approval by DOE, NNSA, and its laboratories, are integral to the GNEP effort and are engaged specifically in the areas of advanced safeguards and non-proliferation.

#### FOSSIL ENERGY BUDGET

*Question.* In your budget justification, the Department supports the FutureGen program to build a cost-effective near-zero atmospheric emissions from coal with the assumption that "the successful and timely achievement of the Fossil Energy R&D objectives" and the availability of technologies for are integrated into FutureGen. However, the budget has proposed to nearly eliminate funding under the Clean Coal Power Initiative—the driver for technology development.

How can the Department hope to build a state-of-the-art facility using yet to be developed technology when you won't commit the resources to develop such technologies?

*Answer.* The fiscal year 2007 budget request represents the necessary funding to develop the technologies arising from our coal research program for FutureGen and near-zero emission coal technologies in general. We believe that the funding level is sufficient to advance these technologies to the level of maturity and acceptable risk for integrated testing in FutureGen. The Clean Coal Power Initiative (CCPI) funding is focused on more mature technologies that are ready for demonstration prior to commercial deployment. The CCPI, however, does reduce the risk of the longer range commercial deployment of future near-zero emission plants based on FutureGen technology by reducing risks in technologies and operations that would have been demonstrated in CCPI such as Integrated Gasification Combined Cycle.

#### CLEAN COAL POWER INITIATIVE—USE OF CARRYOVER BALANCES

*Question.* The DOE 5-year budget justification claims that the Department will provide out-year funding for Clean Coal Power Initiative (CCPI) demonstration of

advanced coal technologies, “contingent upon improvement of use of funds already provided for projects.”

What exactly does the Department expect in terms of “improvement of use of funds” that will support future appropriations to the Department’s leading coal R&D program?

Answer. The program is working to reduce the time between project selection and award as well as the negotiating time for ongoing projects to proceed to the next budget phase, ensure that projects progress to commencement of construction in a timely manner, strengthen the Department’s ability to withdraw funding from stalled projects, ensure project selection consistency with the R&D Investment Criteria, and improve contract and project management controls to achieve the desired results.

*Question.* If the Department is dissatisfied with the performance of the existing competitively-awarded clean coal projects, what do you intend to do to improve performance of the projects?

Answer. As identified in the Program Assessment Rating Tool (PART) review, project delays in CCPI have resulted in high unobligated balances, currently over \$500 million. This is partially a result of lengthy negotiations due to the complexity of the projects, and statutory requirements to have available full funding for these projects. In addition, extended negotiations over contract terms, private sector difficulty securing adequate financing for their cost share, private sector difficulty obtaining permits, and other issues have contributed to the unobligated balances situation for projects or independent components of projects that were selected several years ago and have not begun construction.

The issue is two-fold. First, these are complex project agreements to negotiate and frequently require the industrial participant to obtain items such as power purchase agreements that the participant must separately negotiate before coming to closure on the cooperative agreement with the Department. Secondly, the projects that have been awarded are commercial demonstrations and therefore are also susceptible post-award to changes in market conditions which could result in loss of power purchase agreements or technology development risks, which in turn lead to delays.

The Department is aiming to improve the process and minimize the disruptions and delays due to changing market conditions by better anticipating possible market impacts and addressing them earlier in the negotiation process. The Department is also developing contract provisions and other process improvements that strengthen the Department’s ability to withdraw funding from stalled projects. Project selection will be improved by ensuring consistency of the selection process with the R&D Investment Criteria.

If for some reason a Clean Coal Power Initiative (CCPI) project that was competitively awarded does not progress satisfactorily to the next phase because of either not meeting the milestones, or incurs inordinate delays, then the Department will to the extent possible assist the project participant in overcoming hurdles to move a project forward. If these obstacles cannot be resolved, the Department will pursue a mutual agreement or exercise other contractual provisions to terminate the project, and make the remaining funds available for a future CCPI solicitation.

The Department is also working to improve contract management processes in response to GAO and DOE Inspector General reports identifying weaknesses.

*Question.* Does the Department have any plans to re-compete any of the existing awards? If so, which one?

Answer. The Department does not plan to re-compete any of the existing awards. In the case when a project is terminated, the available funds will go towards a future CCPI solicitation.

#### HYDROGEN

*Question.* Secretary Garman, I have been pleased to see the significant developments made at our national labs in the area of hydrogen fuel cells. Los Alamos National Laboratory in particular has been a leader in this area. The Department has developed an excellent roadmap leading to the introduction of hydrogen fuel cells.

In your view are you receiving adequate resources to move to the next level in your roadmap?

Answer. Yes, the administration’s funding request is sufficient to keep the hydrogen program on track to develop the critical technologies that will enable industry to make a commercialization decision in 2015 on hydrogen fuel cell vehicles and the infrastructure to refuel them.

## NEXT GENERATION NUCLEAR PLANT

*Question.* Despite the significant support for the GNEP program, I question whether or not the Department is as serious about the Next Generation Nuclear Plant that will also support the President Nuclear Hydrogen Initiative.

When does the Department intend to begin construction on the Next Generation Nuclear Plant?

*Answer.* The Department is committed to meeting the Energy Policy Act requirements for the Next Generation Nuclear Plant. A wide spectrum of R&D activities is underway focusing on development of nuclear fuels, metallic and graphite materials capable of high-temperature service, and analytical methods to be used in assessing reactor system safety and performance. The R&D program will inform a decision by 2011 to proceed with the design competition for the NGNP as mandated by EPAct. The design competition is expected to take 2 years. A decision to construct would be expected to follow completion of final design activities. The Department is working with the Nuclear Regulatory Commission on a licensing strategy for the NGNP.

*Question.* Without this plant, how will the Department validate the Nuclear Hydrogen Initiative, much less develop hydrogen from non-fossil sources such as natural gas?

*Answer.* The Department is currently developing two systems of hydrogen production (thermochemical cycles and high-temperature electrolysis) using nuclear energy. Prototype testing of these processes are planned using non-nuclear heat sources. The results from the prototype tests will be used to guide the design of the engineering-scale facility to be coupled with the NGNP. While the NGNP would be capable of driving either of these systems, research is being conducted to lower the process heat requirements to reduce the technical risks associated with the very high operating temperatures of the NGNP.

## URANIUM SUPPLY

*Question.* Congress and the Bush Administration are encouraging the development of additional nuclear powerplants. Other nations are also aggressively pursuing the construction of new nuclear reactors. This is going to require more uranium to fuel our current and new reactors.

Has DOE done any analysis on the availability of uranium inside the United States for nuclear power reactors over the next decade?

*Answer.* The Department has analyzed a number of commercially-available reports on the quantity and quality of domestic uranium reserves and resources that could be developed over the next decade. We would be happy to provide you with a briefing if you would like.

## BARTER OF URANIUM

*Question.* This subcommittee in the fiscal year 2006 Energy and Water Appropriations conference report directed DOE to follow government procurement procedures in any sales or bartering of DOE uranium inventories.

Does DOE believe it is required to follow this directive?

*Answer.* The Department has fully complied with the Section 314 of the fiscal year 2006 Energy and Water Development Appropriations Act including the provision that "applicable" procurement laws and regulations be followed. Because a sale, transfer or barter is not considered a "procurement," provisions of the Competition in Contracting Act and the Federal Procurement Regulations are not applicable. Nevertheless, DOE documented its justification for the initial transfer of uranium to USEC for competitive sale as if those provisions applied. This transfer of a small amount of uranium to USEC (200 metric tons) was necessary to secure funding for USEC's continuation of the uranium remediation activities with no disruption. DOE recently conducted a competitive sale for 200 metric tons.

*Question.* What has DOE done to follow this directive?

*Answer.* The Department issued a Request for Proposals which closed this month for the Department's sale of 200 metric tons.

## AMERICAN CENTRIFUGE PROGRAM—USEC

*Question.* The Department has transferred the technology for the American Centrifuge Program to USEC, Inc. to commercialize. As part of the June 2002 agreement between DOE and USEC, there are a number of milestones that USEC is required to meet this summer and fall. There is concern since USEC's NRC license application appears to be delayed.

Have you been briefed on the technology development program and do you believe that this technology is workable and is commercially viable at full scale?

Answer. The Department is monitoring USEC's activities toward meeting its obligations under the June 2002 Agreement with DOE. We receive regular reports on the status of USEC's research and development program. The technology was proven in the government's program in the 1980's. The Department believes that the market will decide if American Centrifuge Program is commercially viable.

*Question.* Are there any specific technical concerns you may have regarding the deployment of this technology? Are you confident that this project is well managed and following appropriate scientific practices to validate this technology?

Answer. DOE is not in a position to assess the USEC practices since this is a not a government-directed program.

#### URANIUM INVENTORY

*Question.* Given the increased national interest in nuclear power, the key role that fuel supply policy will play going forward and the increased interest by this subcommittee in DOE uranium inventory management, this seems to me to be the wrong time to remove these issues from DOE HQ and place them in a group whose experience is primarily in selling assets.

I would feel much better knowing that these crucial functions, if they are to be transferred from the Office of Nuclear Energy, be transferred to your office, Mr. Under Secretary.

Will you give this serious consideration and report back on the decision to the subcommittee?

Answer. No decision has been made on transferring the functions. That said, these functions currently report to my office through the Office of Nuclear Energy. Should the Department conclude that it is more effective to transfer the functions, they likely would remain within my purview. I will keep the subcommittee apprized as we consider this issue.

#### URANIUM MINING

*Question.* Domestic producers of uranium recently wrote Secretary Bodman and urged the DOE to maintain its uranium inventories for a possible shortfall between supply and consumption that they believe will grow annually over the next decade.

Did the Department meet with the domestic producers to address their concerns?

Answer. Prior to receiving their letter, the Office of Nuclear Energy staff met with the Uranium Producers of America. We believed that we addressed their concerns. More recently, Assistant Secretary Dennis Spurgeon met with several uranium companies this month to discuss their concerns.

*Question.* What was DOE's response to this issue?

Answer. The Department closely monitors activities in the nuclear fuel market for any potential major disruption of fuel supply to our Nation's commercial nuclear power reactors and has a designated uranium inventory to ensure the reliability of deliveries under the Highly Enriched Uranium Purchase Agreement with the Russian Federation.

As part of a March 1999 Agreement concerning the transfer of source material to the Russian Federation, DOE agreed to maintain a stock for 10 years of no less than 22,000 metric tons of natural uranium equivalent. The Agreement states that "the stock may be reduced, through the withdrawal of uranium, in order to ensure the reliability of deliveries under the Commercial Agreement." DOE continues to maintain this stock.

*Question.* Has DOE made any effort to encourage new domestic uranium production?

Answer. We believe that market forces (the current price as of April 10 is \$41.00/lb.) will stimulate new domestic production.

#### WIND ENERGY

*Question.* In the fiscal year 2006 Energy and Water Conference Report, the Department was instructed to shift responsibility for the integration of renewable technology to the Office of Electricity Delivery and Energy Reliability. However, your budget provides nearly \$8 million in funding for program staff to interface with FERC, regional transmission organizations, independent system operators and State regulators.

Do you believe that the wind program staff is better able to perform this function than the staff of the Electricity Delivery and Reliability Office? If so, why have we bothered to establish the Office of Electricity Delivery and Reliability?

Answer. Senior staff from the Office of Energy Efficiency and Renewable Energy (EERE) and the Office of Electricity Delivery and Energy Reliability (OE), met May 16, 2006 to examine coordination between offices, and the appropriate roles and responsibilities between them. Our two offices have jointly decided to establish a formal working partnership for coordinating the work on wind and electricity systems integration.

Of the requested \$8 million in fiscal year 2007, the majority of funds will be used to characterize wind, turbine operations, plant behavior and interconnection electronics, with \$3.97 million devoted to Systems Integration. Of the Systems Integration total, \$500,000 is planned for interfacing with FERC, regional transmission organizations, independent system operators and State regulators of which OE will serve as the lead DOE organization.

*Question.* Has the Department committed funds within the wind energy program to support integration activities in fiscal year 2006—is the Electricity and Reliability Office involved?

Answer. Yes, the Department has committed \$2.4 million in fiscal year 2006 for system integration activities in the Wind Technology Program and program staff interacts on an ongoing basis with colleagues in the Office of Electricity Delivery and Energy Reliability (OE). Wind Program management recently discussed with OE the wind program vision for improved grid availability, as well as the role of expected wind development in the National Interest Electric Transmission Corridor Study under Section 1221 of EPAct. EERE continues to closely coordinate all its electricity-related actions with OE.

#### SOLAR AMERICA INITIATIVE

*Question.* The President has proposed the Solar America Initiative to achieve market competitiveness of solar electricity by 2015 instead of 2020. This program appears to shift from a demonstration approach to that of a technology development program with industry.

Which technologies will the Department focus on and which have the greatest opportunities to meet the 2015 goal?

Answer. To meet its 2015 goals, the Solar America Initiative (SAI) will support R&D and manufacturing improvements through industry-led partnerships to reduce the cost of solar electric systems and optimize system performance. The R&D work will be complemented by a technology acceptance effort to help overcome the non-R&D barriers to commercialization of solar electric systems. SAI focuses work on both photovoltaics such as thin-film and multi-junction photovoltaics, but also supports concentrating solar power (CSP) technologies such as dishes and parabolic collectors.

*Question.* What technology developments have occurred that led the Department to believe that it could make solar energy cost competitive 5 years ahead of schedule?

Answer. The Department believes that the cost competitiveness of solar energy can be accelerated by focusing on the transfer of demonstrated high-efficiency cells from the laboratory, to large scale industrial production through public-private collaboration with industry-led "Technology Pathway Partnerships". We also believe that our increased funding request will accelerate the pace at which we will achieve results that can lower costs.

#### HYDROGEN COMPETITIVENESS

*Question.* The President established the Hydrogen Fuel Initiative to develop a hydrogen economy. One goal was to cut the production and delivery cost of hydrogen in half by 2010.

How successful has the Department been in achieving this goal?

Answer. Significant progress has been made in reducing the cost of hydrogen. For example, the cost of distributed hydrogen production from natural gas has fallen from \$5.00/gallon of gasoline equivalent (gge) in 2003 to a current cost of about \$3.10/gge. This cost is estimated using an economic model developed by the National Renewable Energy Laboratory and industry partners. Additionally, an independent panel has been commissioned to verify that our 2005 target of \$3.00/gge has been met.

These analysis activities use the Energy Information Administration (EIA) High A price projections for natural gas, which are typically less than today's market price. Therefore, the Department will continue to evaluate the effect of natural gas price volatility on the viability of this hydrogen pathway to compete with conventional fuels such as gasoline.

*Question.* What about achieving the stated goals for reducing the cost of renewable production (distributed) sources?

*Answer.* The Department believes that renewable hydrogen production pathways are critical to the long-term success of the President's Hydrogen Fuel Initiative to reduce our dependence on foreign oil and to reduce greenhouse gas and criteria emissions. Multiple renewable hydrogen production pathways are being pursued, including biomass gasification/reforming, renewable fuel reforming, photoelectrochemical, photobiological, solar high-temperature thermochemical, and water electrolysis using renewable electricity resources.

Because appropriations have fallen short of request levels and Congressionally-directed projects consumed a significant portion of the budget in fiscal year 2005 and fiscal year 2006, the Department had to prioritize funding for its proposed projects. The Department chose to focus on distributed natural gas technologies that would most likely help to achieve the 2015 technology readiness milestone. Funding for hydrogen production projects on electrolysis and distributed reforming of renewable liquids was reduced, while funding for other longer-term renewable technologies was eliminated (total funding of renewable hydrogen production was reduced from a planned level of approximately \$24 million to \$13.1 million). Therefore, progress on the cost reduction of many renewable hydrogen production technologies has been limited. For example, cost of hydrogen from renewable bio-liquids in 2003 was \$6.70/gallon of gasoline equivalent and has not fallen appreciably toward our 2015 target of \$2.50/gallon of gasoline equivalent. The President's fiscal year 2007 budget request includes funding for renewable hydrogen projects.

#### HYDROGEN MANUFACTURING

*Question.* For the first time in the past 2 years the Department has provided funding for manufacturing R&D within the hydrogen account.

What type of R&D is being proposed? Who will perform this activity?

*Answer.* On January 24, 2006, Secretary Bodman released a "Roadmap on Manufacturing R&D for the Hydrogen Economy" for public comment. This roadmap, developed with interagency and industry input, identifies future high-priority manufacturing needs (automated/agile processing, high speed forming/molding, joining technology, non-destructive inspection techniques, etc.) in polymer electrolyte membrane fuel cells, high pressure composite storage tanks, and fuel reformers and electrolyzers for producing hydrogen.

Based on further industry comments, due April 24, 2006, the Department will update the roadmap and establish priorities for an upcoming solicitation. The organizations performing the new manufacturing research will be competitively selected. Teams could include industry, national laboratories, and university partners.

#### HYDROGEN AND FUEL CELL PROGRAM

*Question.* One of the major elements of the bill (Title 8) was a roadmap that included revised funding and milestones for development of hydrogen and fuel cells under the FreedomCAR and Fuel Partnership. The provisions are the result of extensive collaboration between the hydrogen and fuel stakeholders and policy makers in which the research and development needs of DOE and the participating industries were extensively re-evaluated. Title VIII reflects what Congress determined will be needed to meet the President's 2010 and 2015 goals for hydrogen powered fuel cell vehicles.

Can you discuss how the statutory directives of EPAAct 2005 figured in the fiscal year 2007 budget request? Can you tell me how DOE plans to meet the law's goals?

*Answer.* The President's fiscal year 2007 budget request of \$289.5 million for the Hydrogen Fuel Initiative is consistent with Title VIII of the Energy Policy Act of 2005.

In particular, the Department's multi-year planning drove the budget request which fully supports the statutory timeline and goals related to vehicles and infrastructure stipulated in Section 805. We plan to meet these goals through research partnerships with industry technology developers, national labs, and universities. The majority of funding will remain focused on research to help achieve cost and performance targets, in accordance with the administration's R&D investment criteria. Limited learning demonstrations covering multiple applications will be used to refocus research and to periodically validate progress.

#### BIOMASS

*Question.* The Department has requested a significant increase in the Biomass program, including substantial increases in funding for thermochemical platform R&D and biochemical platform R&D.

Which of these technologies has the greatest potential to reduce the costs of biomass production?

Answer. It's difficult to answer this question with any degree of certainty at this time. There are a wide variety of feedstocks that can be converted to ethanol, and different feedstocks are available in different regions of the country. Ultimately, the most economic conversion technology—the biochemical (fermentation) or the thermochemical (gasification and pyrolysis)—may depend on the feedstock used.

#### STRATEGIC PETROLEUM RESERVES

*Question.* The fiscal year 2007 budget doesn't request any additional funding to make repairs to the Strategic Petroleum Reserve after a direct hit by Hurricane Katrina.

Is it fair to say that the SPR handled oil supply shortages in the Gulf region using already allocated funds?

Answer. The SPR had sufficient funds to repair the minor damage that was caused by Hurricane Katrina. The damage included roofing, fencing and damaged trailers. The total cost of repairs was less than \$1 million and was covered by our fiscal year 2006 appropriation.

#### HURRICANE KATRINA DISASTER RECOVERY

*Question.* In the wake of Hurricane Katrina, you have created a program within Building Technologies called, "Disaster Recovery and Building Reconstruction."

Could you please expand upon this program and specify how it will help in the rebuilding of the Gulf Coast?

Answer. In November 2005, the Department launched its Disaster Recovery and Building Reconstruction web site ([www.eere.energy.gov/buildings](http://www.eere.energy.gov/buildings)), providing building resources, lessons learned from past disasters, and a calendar of workshops and training sessions being conducted throughout the Gulf region. This is not a new program as such, but rather a compilation of our existing efforts and partnerships applicable to rebuilding the Gulf region. We also continue to work with State energy offices, universities, and businesses in the affected States to encourage a broad regional exchange of information and best practices on energy efficient building technologies.

#### KATRINA—EPACT

*Question.* The tragedy of Hurricane Katrina presents a unique situation in which thousands of buildings and homes need rebuilding. In addition the Energy Policy Act provided the Department with additional authorities to establish in the Energy Policy Act. Sections 126 and 140 both authorize the Department to establish programs to facilitate energy efficiency and the integration on renewable energy technology. Obviously, the Gulf Coast region provides a great opportunity for the Department to develop these pilot programs.

Has the Department taken any steps to help the disaster recovery by promoting or encouraging the use of energy efficient building materials?

Answer. Yes, the Department is actively working with universities, extension services, builders, and building materials suppliers to encourage the use of energy efficient practices and energy efficient building materials. For example, the Department is partnering with The Home Depot, the Department of Housing and Urban Development, and State energy offices on a series of weekend training sessions on how to repair storm-damaged homes using energy efficient products and practices. Training sessions were held in New Orleans, Louisiana on January 22–23, Biloxi, Mississippi on January 28–29, and in Mobile, Alabama on February 4. These events attracted over 2,000 attendees. We are working closely with The Home Depot and other retailers to design a series of on-going events in the spring and summer to prepare for the upcoming hurricane season.

#### WEATHERIZATION PROGRAM

*Question.* The Department has proposed cuts to cut the Weatherization Assistance Program by \$77 million. This will impact 33,000 families who will pay an estimated \$200 million in heating and cooling assistance if they don't receive this aid.

At a time when home energy bills are very high and there are a large number of people in the Gulf States who will be struggling to pay their bills this year, why did you decide to cut money from these grants?

Answer. From 2002 through 2006, the administration requested a total of \$1.359 billion for the Weatherization Program, nearly doubling the baseline funding assumptions (using 2001 appropriations). Unfortunately, Congressional appropriations

from 2002 through 2006 fell short of the administration's requests by a cumulative total of \$208 million. Nevertheless, increased appropriations driven by the President's 2002 through 2006 budgets led to energy and cost savings for hundreds of thousands of the neediest low-income families.

The administration made very difficult choices in developing the fiscal year 2007 budget. Reducing America's growing dependence on foreign oil and changing how we power our homes and businesses are among the Department's highest priorities, as outlined in the President's Advanced Energy Initiative.

The Department's benefits models indicate that the Weatherization Program does not provide significant energy benefits compared to the potential benefits of other programs where we are increasing our investments.

We note that financial aid for helping low-income families pay their energy bill is provided by the Department of Health and Human Service's Low Income Home Energy Assistance Program (LIHEAP).

#### PHOTOVOLTAIC ENERGY COMMERCIALIZATION PROGRAM

*Question.* The Energy Policy Act of 2005 created the "Photovoltaic Energy Commercialization Program," which aims to establish photovoltaic solar electric systems for electric production in public buildings. The request for photovoltaic energy systems is up more than 50 percent from fiscal year 2006.

Is this effort to increase the use of solar power in public buildings included in the President's Solar America Initiative? In what other ways is the Solar America Initiative planning to use the requested \$65 million plus up from fiscal year 2006?

*Answer.* The "Photovoltaic Energy Commercialization Program" contained in Section 204 of the Energy Policy Act of 2005 is not part of the President's Solar America Initiative (SAI). Section 204 authorizes the Administrator of the General Services Administration (GSA) to establish a photovoltaic (PV) commercialization program. The Department is willing to provide technical assistance to GSA, should GSA decide to implement such a program.

The additional funding that the Department of Energy is requesting in fiscal year 2007 for the Solar America Initiative is to achieve the goal of cost-competitive (currently estimated at 5 to 10 cents per kilowatt-hour) solar power by 2015. The majority of requested SAI funds will be used to support a competitive solicitation for industry-led R&D to reduce costs along multiple photovoltaic technologies, some of which may be down-selected in future years. Ultimately, we aim to have partners demonstrate the ability to produce fully-integrated cost-competitive photovoltaic systems optimized for U.S. markets by 2015. In addition, the Department is also planning to issue a second, smaller competitive solicitation in the area of solar technology acceptance that may include funding for technology assistance to promote the commercialization of photovoltaic systems in public buildings. The Department is in the process of developing its strategy for this technology acceptance solicitation, and will seek public feedback shortly to help inform the structure and content of the solicitation.

#### OFF-SHORE WIND ENERGY DEVELOPMENT

*Question.* As part of the Energy Policy Act, Congress streamlined the permitting process and jurisdictional confusion regarding the permitting of offshore renewable energy projects, which have been a barrier to development. Several offshore wind projects have been announced, but none of the projects have been developed. In addition the Department has announced that it will support an offshore wind demonstration.

What is the status of the regulatory reform process and are you confident that this will result in an efficient and streamlined permitting process?

*Answer.* The Energy Policy Act of 2005 outlined a path to develop new regulations to manage the approval process for offshore wind and other renewable energy projects on the Outer Continental Shelf (OCS) and assigned the Department of the Interior's Minerals Management Service (MMS) as the lead agency. There are no interim policies or guidelines; however, MMS issued an Advanced Notice of Proposed Rulemaking to solicit comments from stakeholders in developing the language for the new regulations. The Department of Energy's Office of Wind and Hydro-power Technologies Program will continue providing technical and other assistance to MMS under a soon-to-be-finalized Memorandum of Agreement related to offshore wind energy issues.

*Question.* How many wind projects have been announced or are under consideration? How many megawatts of fossil energy will these projects displace and by when?

Answer. Several offshore wind projects have been announced, although only two have taken formal steps required to begin the regulatory review process required for sites in Federal waters. The two commercial projects include the Cape Wind Project (420 megawatts), and the Long Island Power Authority/FPL Energy project (143 megawatts). The wind generated power from these projects would likely displace oil and natural gas-fired peaking powerplants.

*Question.* How many megawatts of energy could the United States expect to produce from offshore wind?

Answer. Preliminary estimates conducted at the National Renewable Energy Laboratory (NREL) indicate that more than 1,000 gigawatts of offshore wind energy potential exist in the United States between 5 and 50 nautical miles off the coastlines, including the Great Lakes, with approximately 810 gigawatts over waters that are 30 m and deeper (Future of Offshore Wind Energy in the United States, June 2004; [www.nrel.gov/docs/fy04osti/36313.pdf](http://www.nrel.gov/docs/fy04osti/36313.pdf)). Realizing even a fraction of this presents major economic, technical, and social challenges.

#### AMERICAN CENTRIFUGE PROJECT

*Question.* As you know, the Department of Energy signed in 2002 a lease agreement with the United States Enrichment Corporation (USEC) for centrifuge technology. Currently, USEC is planning on constructing the American Centrifuge Plant (ACP) based upon a former DOE design that was never fully proven. History tells us that DOE spent more than two decades and \$3 billion on centrifuge technology.

What compensation did the Federal Government receive for this technology transfer?

Answer. To obtain access to the restricted data related to the gas centrifuge enrichment process, identified at 10 C.F.R. 725.31 Appendix A as category C-24 isotope separation. USEC was required by regulation to pay, and did pay, \$25,000. USEC also is fully funding development activities under the Cooperative Research and Development Agreement (CRADA) with the Oak Ridge National Laboratory. Finally, the Department is currently negotiating, but has not yet executed, a technology licensing agreement with USEC that addresses royalty payments for USEC's commercialization of DOE centrifuge technology.

*Question.* Is the Federal Government liable should the technology prove unworkable?

Answer. No.

*Question.* Does DOE currently have departmental personnel working on this project?

Answer. Since USEC's CRADA is with ORNL, there are some laboratory personnel working on the project. USEC pays 100 percent of the costs under the CRADA. Some DOE employees provide the required regulatory oversight.

*Question.* At what stage in machine development is USEC?

Answer. Because USEC is a private company and the technology development program is privately funded, its detailed development information is considered business proprietary to USEC and may be subject to protections under the Trade Secrets Act. Under this Act, DOE is obliged to take measures to protect such business proprietary information from public disclosure. In response to the committee's request for business proprietary information in its oversight capacity, the Department will provide the information requested in the Department's possession under separate cover in a secure fashion in accordance with applicable law and the Department's procedures.

*Question.* Are individual prototype machines still being tested as reported in November 2005? What is the DOE's level of participation?

Answer. As noted previously, this information is business proprietary to USEC. As a result, a response will be provided under separate cover. DOE provides regulatory oversight to ensure that industrial safety and environmental requirements are met.

*Question.* What does prototype machine testing by USEC actually mean and involve? What is the DOE's level of participation?

Answer. As noted previously this information is business proprietary to USEC. As a result, a response will be provided under separate cover. DOE is involved in a regulatory capacity to ensure that industrial safety and environmental requirements are met.

*Question.* Is there any chance that the reliability and performance data will not be ready for the DOE October Milestone?

Answer. The Department is not in a position to respond to this question.

*Question.* Will the October data include economic performance data? If not, when will such data be available?

Answer. The Department is not in a position to respond to this question.

*Question.* Will economic data be proven for financing commitments to be obtained by January 2007 for the 1 million SWU plant?

Answer. The Department is not in a position to respond to this question.

*Question.* If “cast-iron” economic data is not available by January 2007, how can construction begin to meet the DOE June 2007 Milestone?

Answer. The June 2007 construction milestone is tied to a licensing decision by the Nuclear Regulatory Commission which is required before USEC can begin construction. The economic data requirement is an for USEC to resolve.

*Question.* Is there a “fall-back” strategy in the event that the ACP cannot be developed as a commercially viable economic option in accord with the DOE June 2002 Agreement?

Answer. The Department is not currently evaluating alternatives to the APC option.

*Question.* Are real and proven alternative production technology options being investigated, other than continued and indefinite operation of the Paducah Gaseous Diffusion Plant?

Answer. The Department is closely following developments in the domestic enrichment marketplace including the proposed LES centrifuge plant plans in New Mexico. We believe that market forces will work to provide sufficient domestic capacity to meet U.S. utility requirements.

#### RECLASSIFYING WASTE AT HANFORD, WASHINGTON

*Question.* Mr. Rispoli, the Congress reclassified certain waste as being “incidental to reprocessing” and as a result, this would allow the Department to leave a small amount of material in the tanks that would be filled with grout to permanently immobilize any remaining waste. This is the standard being applied to cleanup at Idaho and Savannah River. I am told that applying this same authority to the Hanford tank farm has the potential to save between \$10–\$15 billion.

If this authority was extended to Hanford, can you estimate the budgetary impact would be for this project? How much time could be saved?

Answer. The Department of Energy (DOE) committed during the debate on section 3116 of the National Defense Authorization bill that we would not work unilaterally to add another State to the reclassification authorization. That being said, DOE has not completed an analysis to determine how much time or money could be saved should this authority be extended to Washington State.

*Question.* Does the Department believe this standard should be applied to the Hanford tank farm cleanup?

Answer. The Department of Energy (DOE) has discussed with State of Washington officials on several occasions the benefits it perceives that application of section 3116 would offer to the citizens of the State of Washington. These benefits include a provision for the U.S. Nuclear Regulatory Commission’s consultation and monitoring, and the certainty concerning the process to be used in making determinations. However, the DOE committed during the debate on section 3116 of the National Defense Authorization bill that we would not work unilaterally to add another State to the reclassification authorization. That being said, DOE has not completed an analysis to determine how much time or money could be saved should this authority be extended to the State of Washington.

#### HANFORD CLEANUP—FAVORITE AMONG EQUALS

*Question.* The Environmental Cleanup budget is down by over \$762 million. Funding for cleanup at virtually every site in the complex is down. Los Alamos has been reduced by over \$50 million; Idaho is down \$20 million; Savannah River is down by \$94 million. In contrast, funding for Hanford is up, despite the fact that we still don’t have a clear idea how much the Waste Treatment Facility will cost.

We do know that Bechtel, the current contractor, estimates it will cost over \$11 billion. This is up from the original cost estimate of \$4.3 billion in 2000.

In the 2006 budget request, the Department predicted with 80 percent certainty that the cost of the project would be \$5.8 billion and be completed by 2011. This is incredible to me that in 1 year the cost of the project could go from \$5.8 billion to \$11 billion.

It appears that everything that could go wrong with this project has gone wrong. There has been tremendous technical risk, poor engineering and design management, and regulatory uncertainty as a result of the Defense Nuclear Facilities Safety Board.

Mr. Garman, when will you have a better sense of the final cost estimate for the Waste Treatment Project?

Answer. In December 2005, the Department of Energy directed the Waste Treatment and Immobilization Plant (WTP) prime contractor, Bechtel National Inc., to deliver an updated Estimate-At-Completion (EAC) to reflect available funding for fiscal year 2006 and impacts of the results of the independent technical and cost reviews by May 31, 2006.

DOE has engaged the U.S. Army Corps of Engineers to perform an independent expert review of the EAC and to validate the EAC. The USACE has retained a number of recognized industry experts working with its own senior staff to perform this review. The USACE's report is scheduled to be completed by late summer 2006. Once the EAC is validated by the USACE, DOE would then validate and approve the baseline for the WTP project.

*Question.* What can and will be done to get control of this project and to reverse the cost increases?

Answer. I think it is important to note that all prior planned designs for the Waste Treatment and Immobilization Plant (WTP) were based on a plant capable of treating and immobilizing only one-fourth of the high-level waste at the Hanford site. The current plant is sized to treat and immobilize 100 percent of the high-level waste, thus eliminating the need for a second, very sizeable and costly plant that the Department of Energy's (DOE's) prior plan had envisioned. In addition, since this project first got underway in the late 1990's, major advancements in technology have been recognized that will improve WTP performance. These advancements include: development of an ion exchange material to more effectively and less expensively remove radioactive cesium from tank waste liquids; improvement of throughput capacities for the furnaces used to vitrify the radioactive waste; and enhanced blending ability of pumps to maintain a consistent waste mix. We anticipate that benefits from these improvements will avoid the necessity of building a second plant for high-level waste, improve turnaround time, reduce personnel exposure, reduce performance risk and operating cost, and reduce the total number of canisters produced, thereby decreasing the volume of material ultimately sent to a repository for permanent disposal.

On June 23, 2005, the Secretary of Energy made key decisions to address the WTP project scope, cost, schedule, contract, and management issues. The management actions included direction to: (1) conduct an After Action Review to assess the causes of the project cost, schedule, scope and project management issues, (2) assemble a new DOE Headquarters senior level management team, (3) submit the qualifications for a Federal Project Director to the DOE Project Management Certification Board, (4) provide weekly progress reports to the Principal Deputy Assistant Secretary for Environmental Management, (5) conduct quarterly progress reviews with the Secretary, and (6) develop an execution plan and master schedule for all of the major activities associated with the path forward for the project.

The Secretary indicated to Bechtel Corporation that it must demonstrate its commitment and project management capabilities to this critical project by accomplishing the following:

- Address the current technical issues, increasing the confidence in design, contain costs, and develop a viable schedule.
- Obtain the “best and brightest” from other major firms to critically assess the current technical approach, evaluate risks, review the cost/schedule, and develop recommendations to promptly and dramatically improve project performance.
- Provide the “best and brightest” site project management team (executives, engineers and technicians) for the duration of the project.
- Develop and submit to DOE a complete and credible Estimate-At-Completion.

Based on the actions directed by the Secretary of Energy and the reviews implemented by independent industry experts, there is now a strong project management framework in-place, a clear understanding of the technical issues surrounding the project, and a path forward for establishing a credible project cost and schedule baseline.

*Question.* What guarantee can you provide that Federal managers will do their job to control costs and demand the best from their contractors?

Answer. To improve project oversight the Department of Energy (DOE) has implemented the following key actions: establishment of a DOE Headquarters senior level oversight team, which is engaged in all aspects of the Waste Treatment and Immobilization Plant (WTP) project; recruitment by DOE of experienced personnel proficient in contracting, procurement, contract law, and project management; Federal certification of the WTP Project Director who is directed to strictly comply with the requirements of DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets; the requirement that the WTP contractor implement an Earned Value Management System, a proven, industry-standard performance moni-

toring tool, that fully complies with American National Standards Institute (ANSI) 748-A-1998; a structured weekly and monthly reporting system, plus a Quarterly Performance review conducted by the Assistant Secretary for Environmental Management; and delivery of regular project status updates to senior DOE management.

The DOE continues to proactively upgrade its project management capabilities at the WTP and strengthen the framework needed to ensure effective planning and long-term execution in all areas of this large, complex environmental remediation project.

*Question.* Do you believe you have the proper contract in place and what incentives are included in the contract to encourage cost reduction?

*Answer.* Yes, I believe the Department of Energy (DOE) has the proper contract in place at the Waste Treatment and Immobilization Plant. DOE has initiated actions to increase and strengthen Federal oversight of this contract. These actions include putting in place a coordinated and aggressive infrastructure of reviews and validations of project costs, schedules, technical design, seismic criteria, overall project management and controls. In parallel, DOE is considering various changes to the incentives structure for an impending contract modification to challenge the contractor to deliver a quality plant that meets the mission need and schedule expectations while achieving cost effectiveness. We hope to complete the contract modification early in fiscal year 2007.

*Question.* What impact have the recommendations by Defense Nuclear Facility Safety Board had on the cost estimate and cost schedule?

*Answer.* The Defense Nuclear Facilities Safety Board (DNFSB) has been actively involved in reviewing the adequacy of the seismic criteria used in the design of the Waste Treatment and Immobilization Plant (WTP). Based on all the reviews, DOE estimates that the impact of revising the seismic criteria, including the associated verification activities, for the WTP has resulted in an estimated overall project cost increase in the range of 10–15 percent with a resulting increase of approximately 20 percent to the overall project completion schedule.

DOE has engaged the U.S. Army Corps of Engineers (USACE) to perform an independent expert review of the Estimate-At-Completion (EAC) and to validate the EAC. This review includes an evaluation of those costs attributable to the inclusion of revised seismic criteria. The USACE's report is scheduled to be completed by late summer 2006.

#### LOS ALAMOS NATIONAL LAB

*Question.* The budget reduces soil and water cleanup activities at Los Alamos National Lab by \$70 million. It has been 2 years since the Department negotiated and signed the 2005 Consent Order with the State of New Mexico on a fence-to-fence cleanup strategy to fully remediate the site by 2015.

The budget justification claims that despite the Department has yet to complete its validation of the site baseline in cost estimate. I find it remarkable that the Department, which has been onsite for more than five decades, doesn't have an accurate picture of the cleanup responsibilities or cost estimate.

The Consent Order requires that the LANL site be cleaned up by 2015. How will a \$70 million reduction in soil and water remediation activities impact this cleanup date?

*Answer.* The Department of Energy (DOE) has had significant performance issues for several years with the previous contractor's environmental work at the Los Alamos National Laboratory (LANL). Additionally, LANL has not yet been able to provide an integrated cost and schedule baseline that DOE is able to validate.

Senior officials within DOE have asked for the involvement of senior executives of the parent companies of the new contractor in delivering efficiencies and a cost and schedule baseline able to withstand scrutiny and that can be validated by DOE. To that end, we believe that the new contract will address these performance issues, offer new opportunities to continue significant cleanup and risk reduction, and enable progress towards a new baseline. We assure you that we remain committed to the Los Alamos Compliance Order on Consent (March 2005) with the State of New Mexico and its environmental milestones.

*Question.* What specific cleanup activities will the Department forego as a result of the \$70 million cut?

*Answer.* The Department of Energy is continuing a broad base of remediation activities. We are evaluating soil and water remediation activities including characterization, protection of groundwater resources, and remediation for opportunities for better performance under the new contract. We believe that the new contract will address past performance issues, offer us new opportunities to continue significant cleanup and risk reduction, and deliver progress towards a new baseline. Until we

have a cost and schedule baseline from the new contractor that is independently validated we are not able to determine what work, if any, will not be accomplished. However, we remain committed to the Los Alamos Compliance Order on Consent.

*Question.* What expectations does the Department have for the new contractor, Los Alamos National Security LLC, to find cost savings to offset the funding reduction in soil and water remediation?

*Answer.* Senior officials within the Department of Energy (DOE) have asked for the involvement of senior executives of the parent companies of the new contractor in delivering efficiencies and a cost and schedule baseline that is able to withstand scrutiny and that can be validated by the DOE. To that end, we believe that the new contract will address the Los Alamos National Laboratory's (LANL) performance issues, offer new opportunities to continue significant cleanup and risk reduction, and deliver progress toward a new baseline. We remain committed to the Los Alamos Compliance Order on Consent.

*Question.* As a result of short-changing cleanup at Los Alamos as specified in the 2005 Consent Order, how much do you believe will the Department incur in the way of fees?

*Answer.* The Department of Energy (DOE) has had performance issues for several years with the previous contractor's environmental work at the Los Alamos National Laboratory (LANL). Additionally, the LANL has not yet been able to provide an integrated cost and schedule baseline that the DOE is able to validate.

We believe that the new contract will address these performance issues, offer new opportunities to continue significant cleanup and risk reduction, and deliver progress toward a new baseline. We remain committed to the Los Alamos Compliance Order on Consent and as such do not anticipate any fines.

#### WASTE TREATMENT PLAN SEISMIC REGULATION

*Question.* It seems odd to me that the Department didn't have a clear picture of the seismic risk before they turned the first spade of dirt at the Waste Treatment Plant.

Why is the Department only now coming to terms with the changes in seismic standards?

*Answer.* The initial seismic design for the Hanford Waste Treatment and Immobilization Plant (WTP) was based on an extensive probabilistic seismic hazard analysis conducted in 1996 by Geomatrix Consultants, Inc. In 1999, the Department of Energy (DOE) approved this design basis following reviews by British Nuclear Fuels, Inc., and seismologists from the U.S. Army Corps of Engineers and the Lawrence Livermore National Laboratory.

DOE used the best information available starting in 1997 regarding the seismic hazard, namely the 1996 DOE Probabilistic Seismic Hazard Analysis. However, seismic information has continually evolved as seismic prediction methodologies have improved. This scientific progress led to the 2004 increases in seismic ground motion that provided a greater allowance for unknown soil and rock properties underneath the WTP site than were considered necessary in 1996. No new information regarding the likelihood of earthquakes or their strength contributed to this change. Rather, the change was due to the possibility that soil and rock underneath the WTP might attenuate earthquake movement less than was assumed in the 1996 work.

*Question.* Can you quantify the cost increases attributed to the change in seismic standards raised by the Defense Nuclear Facilities Safety Board?

*Answer.* Based on all the reviews, the Department of Energy (DOE) estimates that the impact of revising the seismic criteria, including the associated verification activities, for the Waste Treatment and Immobilization Plant has resulted in an estimated overall project cost in the range of 10–15 percent of the Estimate-At-Completion (EAC) with a resulting increase of approximately 20 percent to the overall project completion schedule.

The DOE has engaged the U.S. Army Corps of Engineers (USACE) to perform an independent expert review of the EAC and to validate the EAC. This review includes an evaluation of those costs attributable to the inclusion of revised seismic criteria. The USACE's report is scheduled to be completed by late summer 2006.

*Question.* What other facilities in Washington might be designed to the same seismic standard at the Waste Treatment Plant?

*Answer.* Presently, there are no planned facilities in the State of Washington, including Department of Energy (DOE) facilities that are designed to the current DOE seismic standards. These standards would only apply to new nuclear facilities having the potential for significant onsite consequences.

## SAVANNAH RIVER SITE—SEISMIC REGULATIONS

*Question.* I understand that new seismic standards have forced the Department to reevaluate the design standard of the Salt Waste Processing Facility at Savannah River Site. This halt in progress will increase project costs and delay the start of this project by 2 years.

Why did this happen?

*Answer.* The Department of Energy (DOE) has established design and performance standards associated with Natural Phenomena Hazards (including seismic) in DOE Guide 420.1-2, "Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Non-Nuclear Facilities", and DOE Standard 1021-93, "Natural Phenomenon Hazards Performance Categorization Guidelines for Structures, Systems and Components", that are tailored to the hazards associated with our nuclear facilities. Performance Category 3 (PC-3), representing the most stringent earthquake design requirements, is invoked where the highest hazards exist in these types of facilities.

In accordance with the DOE Directives, early in the design of facilities, the performance categorization is determined and the analysis is refined as the safety documentation matures. The Salt Waste Processing Facility (SWPF) preliminary safety analysis and the original facility design were based on a lower performance category determination. However, while addressing issues raised by the Defense Nuclear Facilities Safety Board the Department determined that the PC-3 design requirements would provide greater assurance that confinement of radioactive materials was adequate given the range of hazards.

## ACCELERATED CLEANUP—CHANGE IN COURSE

*Question.* Last month Secretary Bodman testified that he would not be bound by the commitments by his predecessors regarding funding for Environmental Cleanup. By and large, the funding profile contained in the DOE's 5-year funding plan shows a decline in funding for most of the cleanup activities.

Are we to assume that the Department will reduce funding for environmental cleanup activities, and if so, where and to what end?

*Answer.* As part of the administration's Accelerated Cleanup Initiative, beginning in fiscal year 2003, increased funding was provided to accelerate cleanup and address urgent risks sooner than had been planned. Fiscal year 2005 was the peak year of funding for this initiative. We remain committed to completing the Environmental Management (EM) mission in a manner that protects the environment and public, and is safe for workers, while being fiscally responsible. The Department of Energy will continue to focus on risk reduction and cleanup completion while maintaining balance with other departmental and national priorities.

*Question.* How will out-year funding reductions impact the schedule for the cleanup at all of the cleanup sites?

*Answer.* The funding levels that had been developed in the 5-Year Plan to support the accelerated site closure strategy were based, in part, on overly optimistic assumptions. The Department of Energy (DOE) is currently updating these assumptions to reflect changes that have taken place in regulatory and statutory requirements, to incorporate lessons learned based on actual program performance, and to incorporate technological and acquisition strategies that have matured, with the goal of meeting the DOE's long-term environmental commitments. When these assumptions are fully updated, we will be in a position to assess potential impacts.

## HANFORD CLEANUP—FAVORITE AMONG EQUALS

*Question.* The Environmental Cleanup budget is down by over \$762 million. Funding for cleanup at virtually every site in the complex is down. Los Alamos has been reduced by over \$50 million; Idaho is down \$20 million; Savannah River is down by \$94 million. In contrast, funding for Hanford is up, despite the fact that we still don't have a clear idea how much the Waste Treatment Facility will cost.

Bechtel, the current contractor, estimates the project will cost over \$11 billion. This is up from the original cost estimate of \$4.3 billion in 2001.

In the 2006 budget request, the Department predicted with 80 percent certainty that the cost of the project would be \$5.8 billion and be completed by 2011. This is incredible to me that in 1 year the cost of the project could go from \$5.8 billion to \$11 billion.

It appears that everything that could go wrong with this project has gone wrong. There has been tremendous technical risk, poor engineering and design management, and regulatory uncertainty as a result of the Defense Nuclear Facilities Safety Board.

Mr. Garman, when will you have a better sense of the final cost estimate for the Waste Treatment Project?

Answer. In December 2005, the Department of Energy directed the Waste Treatment and Immobilization Plant (WTP) prime contractor, Bechtel National Inc., to deliver an updated Estimate-At-Completion (EAC) to reflect available funding for fiscal year 2006 and impacts of the results of the independent technical and cost reviews by May 31, 2006.

DOE has engaged the U.S. Army Corps of Engineers to perform an independent expert review of the EAC and to validate the EAC. The USACE has retained a number of recognized industry experts working with its own senior staff to perform this review. The USACE's report is scheduled to be completed by late summer 2006. Once the EAC is validated by the USACE, DOE would then validate and approve the baseline for the WTP project.

*Question.* What can and will be been done to get control of this project and to reverse the cost increases?

Answer. I think it is important to note that all prior planned designs for the Waste Treatment and Immobilization Plant (WTP) were based on a plant capable of treating and immobilizing only one-fourth of the high-level waste at the Hanford site. The current plant is sized to treat and immobilize 100 percent of the high-level waste, thus eliminating the need for a second, very sizeable and costly plant that the Department of Energy's (DOE's) prior plan had envisioned. In addition, since this project first got underway in the late 1990's, major advancements in technology have been recognized that will improve WTP performance. These advancements include: development of an ion exchange material to more effectively and less expensively remove radioactive cesium from tank waste liquids; improvement of throughput capacities for the furnaces used to vitrify the radioactive waste; and enhanced blending ability of pumps to maintain a consistent waste mix. We anticipate that benefits from these improvements will avoid the necessity of building a second plant for high-level waste, improve turnaround time, reduce personnel exposure, reduce performance risk and operating cost, and reduce the total number of canisters produced, thereby decreasing the volume of material ultimately sent to a repository for permanent disposal.

On June 23, 2005, the Secretary of Energy made key decisions to address the WTP project scope, cost, schedule, contract, and management issues. The management actions included direction to: (1) conduct an After Action Review to assess the causes of the project cost, schedule, scope and project management issues, (2) assemble a new DOE Headquarters senior level management team, (3) submit the qualifications for a Federal Project Director to the DOE Project Management Certification Board, (4) provide weekly progress reports to the Principal Deputy Assistant Secretary for Environmental Management, (5) conduct quarterly progress reviews with the Secretary, and (6) develop an execution plan and master schedule for all of the major activities associated with the path forward for the project.

The Secretary indicated to Bechtel Corporation that it must demonstrate its commitment and project management capabilities to this critical project by accomplishing the following:

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  - Obtain the “best and brightest” from other major firms to critically assess the current technical approach, evaluate risks, review the cost/schedule, and develop recommendations to promptly and dramatically improve project performance.
  - Provide the “best and brightest” site project management team (executives, engineers and technicians) for the duration of the project.
  - Develop and submit to DOE a complete and credible Estimate-At-Completion.
- Based on the actions directed by the Secretary of Energy and the reviews implemented by independent industry experts, there is now a strong project management framework in place, a clear understanding of the technical issues surrounding the project, and a path forward for establishing a credible project cost and schedule baseline.

*Question.* What guarantee can you provide that Federal managers will do their job to control costs and demand the best from their contractors?

Answer. To improve project oversight the Department of Energy (DOE) has implemented the following key actions: establishment of a DOE Headquarters senior level oversight team, which is engaged in all aspects of the Waste Treatment and Immobilization Plant (WTP) project; recruitment by DOE of experienced personnel proficient in contracting, procurement, contract law, and project management; Federal certification of the WTP Project Director who is directed to strictly comply with the requirements of DOE Order 413.3, Program and Project Management for the Acqui-

sition of Capital Assets; the requirement that the WTP contractor implement an Earned Value Management System, a proven, industry-standard performance monitoring tool, that fully complies with American National Standards Institute (ANSI) 748-A-1998; a structured weekly and monthly reporting system, plus a Quarterly Performance review conducted by the Assistant Secretary for Environmental Management; and delivery of regular project status updates to senior DOE management.

The DOE continues to proactively upgrade its project management capabilities at the WTP and strengthen the framework needed to ensure effective planning and long-term execution in all areas of this large, complex environmental remediation project.

*Question.* Do you believe you have the proper contract in place and what incentives are included in the contract to encourage cost reduction?

*Answer.* Yes, I believe the Department of Energy (DOE) has the proper contract in place at the Waste Treatment and Immobilization Plant. DOE has initiated actions to increase and strengthen Federal oversight of this contract. These actions include putting in place a coordinated and aggressive infrastructure of reviews and validations of project costs, schedules, technical design, seismic criteria, overall project management and controls. In parallel, DOE is considering various changes to the incentives structure for an impending contract modification to challenge the contractor to deliver a quality plant that meets the mission need and schedule expectations while achieving cost effectiveness. We hope to complete the contract modification early in fiscal year 2007.

*Question.* What impact have the recommendations by Defense Nuclear Facility Safety Board had on the cost estimate and cost schedule?

*Answer.* The Defense Nuclear Facilities Safety Board (DNFSB) has been actively involved in reviewing the adequacy of the seismic criteria used in the design of the Waste Treatment and Immobilization Plant (WTP). Based on all the reviews, DOE estimates that the impact of revising the seismic criteria, including the associated verification activities, for the WTP has resulted in an estimated overall project cost increase in the range of 10–15 percent with a resulting increase of approximately 20 percent to the overall project completion schedule.

DOE has engaged the U.S. Army Corps of Engineers (USACE) to perform an independent expert review of the Estimate-At-Completion (EAC) and to validate the EAC. This review includes an evaluation of those costs attributable to the inclusion of revised seismic criteria. The USACE's report is scheduled to be completed by late summer 2006.

#### LOS ALAMOS NATIONAL LAB

*Question.* The budget reduces soil and water cleanup activities at Los Alamos National Lab by \$70 million. It has been 2 years since the Department negotiated and signed the 2005 Consent Order with the State of New Mexico on a cleanup strategy to fully remediate the site by 2015.

The budget justification claims that the Department has yet to complete its validation of the site baseline in cost estimate. I find it remarkable that the Department, which has been onsite for more than five decades, doesn't have an accurate picture of the cleanup responsibilities or cost estimate.

The Consent Order requires that the LANL site be cleaned up by 2015. How will a \$70 million reduction in soil and water remediation activities impact this cleanup date?

*Answer.* The Department of Energy (DOE) has had significant performance issues for several years with the previous contractor's environmental work at the Los Alamos National Laboratory (LANL). Additionally, LANL has not yet been able to provide an integrated cost and schedule baseline that DOE is able to validate.

Senior officials within DOE have asked for the involvement of senior executives of the parent companies of the new contractor in delivering efficiencies and a cost and schedule baseline able to withstand scrutiny and that can be validated by DOE. To that end, we believe that the new contract will address these performance issues, offer new opportunities to continue significant cleanup and risk reduction, and enable progress towards a new baseline. We assure you that we remain committed to the Los Alamos Compliance Order on Consent (March 2005) with the State of New Mexico and its environmental milestones.

*Question.* What specific cleanup activities will the Department forego as a result of the \$70 million cut?

*Answer.* The Department of Energy is continuing a broad base of remediation activities. We are evaluating soil and water remediation activities including characterization, protection of groundwater resources, and remediation for opportunities for better performance under the new contract. We believe that the new contract will

address past performance issues, offer us new opportunities to continue significant cleanup and risk reduction, and deliver progress towards a new baseline. Until we have a cost and schedule baseline from the new contractor that is independently validated we are not able to determine what work, if any, will not be accomplished. However, we remain committed to the Los Alamos Compliance Order on Consent.

*Question.* What expectations does the Department have for the new contractor, Los Alamos National Security LLC, to find cost savings to offset the funding reduction in soil and water remediation?

*Answer.* Senior officials within the Department of Energy (DOE) have asked for the involvement of senior executives of the parent companies of the new contractor in delivering efficiencies and a cost and schedule baseline that is able to withstand scrutiny and that can be validated by the DOE. To that end, we believe that the new contract will address the Los Alamos National Laboratory's (LANL) performance issues, offer new opportunities to continue significant cleanup and risk reduction, and deliver progress toward a new baseline. We remain committed to the Los Alamos Compliance Order on Consent.

#### CONSOLIDATION OF NUCLEAR MATERIAL IN THE COMPLEX

*Question.* The Secretary has wisely assembled a team to consider various options to reduce the amount of special nuclear material in the complex that must receive high level security.

By locating unnecessary nuclear material in a central secure area, it can reduce the security costs dramatically. By permanently disposing of this material we can eliminate security costs entirely.

I understand that Charlie Anderson with Environmental Management has been chosen to lead this team of DOE and NNSA officials.

What is the status of this evaluation and when will the Department propose a waste consolidation and disposal plan to Congress for its consideration?

*Answer.* We currently expect that the strategic plan will be completed within a year.

*Question.* What are the greatest challenges the Department is facing in consolidating this material?

*Answer.* The greatest challenge facing the Department of Energy regarding the consolidation of special nuclear materials is to ensure that our departmental consolidation efforts are consistent with individual program needs while maximizing security and cost savings and minimizing the number of consolidation moves.

Consolidation of nuclear materials also requires, among other things, adequate storage space and availability at the receiving site, compliance with applicable laws, appropriate National Environmental Policy Act analyses, and sufficient transportation resources. Community support is also critical, particularly in the State and around the site where the materials would be received.

*Question.* Are there any legislative or regulatory impediments that currently prevent the Department from moving forward?

*Answer.* Although there may be legislative or regulatory requirements that would need to be met before the Department of Energy may move forward with its consolidation activities, none of these ultimately would prevent us from moving forward when met. For example, there may be National Environmental Policy Act requirements to be met for some activities. Other requirements may also apply, for example, in the case of the shipment of surplus weapons-usable plutonium to the Savannah River Site previously destined for the now-cancelled Plutonium and Immobilization Plant, there are requirements under section 3155 of the National Defense Authorization Act for Fiscal Year 2002 (Public Law 107-107) for the submission of a plan to Congress identifying a disposition path for such plutonium prior to shipment.

#### RECLASSIFYING WASTE AT HANFORD, WASHINGTON

*Question.* Mr. Garman, the Congress reclassified certain waste as being "incidental to reprocessing" and as a result, this would allow the Department to leave a small amount of material in the tanks that would be filled with grout to permanently immobilize any remaining waste. This is the standard being applied to cleanup at Idaho and Savannah River. I am told that applying this same authority to the Hanford tank farm has the potential to save \$10 to \$15 billion.

If this authority was extended to Hanford, can you estimate what the budgetary impact would be for this project? How much time could be saved?

*Answer.* The Department of Energy (DOE) committed during the debate on section 3116 of the National Defense Authorization bill that we would not work unilaterally to add another State to the reclassification authorization. That being said,

DOE has not completed an analysis to determine how much time or money could be saved should this authority be extended to Washington State.

*Question.* Does the Department believe this standard should be applied to the Hanford tank farm cleanup?

*Answer.* The Department of Energy (DOE) has discussed with State of Washington officials on several occasions the benefits it perceives that application of section 3116 would offer to the citizens of the State of Washington. These benefits include a provision for the U.S. Nuclear Regulatory Commission's consultation and monitoring, and the certainty concerning the process to be used in making determinations. However, the DOE committed during the debate on section 3116 of the National Defense Authorization bill that we would not work unilaterally to add another State to the reclassification authorization. That being said, DOE has not completed an analysis to determine how much time or money could be saved should this authority be extended to the State of Washington.

#### WASTE TREATMENT PLAN SEISMIC REGULATION

*Question.* It seems odd to me that the Department didn't have a clear picture of the seismic risk before they turned the first spade of dirt at the Waste Treatment Plant.

Why is the Department only now coming to terms with the changes in seismic standards?

*Answer.* The initial seismic design for the Hanford Waste Treatment and Immobilization Plant (WTP) was based on an extensive probabilistic seismic hazard analysis conducted in 1996 by Geomatrix Consultants, Inc. In 1999, the Department of Energy (DOE) approved this design basis following reviews by British Nuclear Fuels, Inc., and seismologists from the U.S. Army Corps of Engineers and the Lawrence Livermore National Laboratory.

DOE used the best information available starting in 1997 regarding the seismic hazard, namely the 1996 DOE Probabilistic Seismic Hazard Analysis. However, seismic information has continually evolved as seismic prediction methodologies have improved. This scientific progress led to the 2004 increases in seismic ground motion that provided a greater allowance for unknown soil and rock properties underneath the WTP site than were considered necessary in 1996. No new information regarding the likelihood of earthquakes or their strength contributed to this change. Rather, the change was due to the possibility that soil and rock underneath the WTP might attenuate earthquake movement less than was assumed in the 1996 work.

*Question.* Can you quantify the cost increases attributed to the change in seismic standards raised by the Defense Nuclear Facilities Safety Board?

*Answer.* Based on all the reviews, the Department of Energy (DOE) estimates that the impact of revising the seismic criteria, including the associated verification activities, for the Waste Treatment and Immobilization Plant has resulted in an estimated overall project cost in the range of 10–15 percent of the Estimate-At-Completion (EAC) with a resulting increase of approximately 20 percent to the overall project completion schedule.

The DOE has engaged the U.S. Army Corps of Engineers (USACE) to perform an independent expert review of the EAC and to validate the EAC. This review includes an evaluation of those costs attributable to the inclusion of revised seismic criteria. The USACE's report is scheduled to be completed by late summer 2006.

*Question.* What other facilities in Washington might be designed to the same seismic standard as the Waste Treatment Plant?

*Answer.* Presently, there are no planned facilities in the State of Washington, including Department of Energy (DOE) facilities that are designed to the current DOE seismic standards. These standards would only apply to new nuclear facilities having the potential for significant onsite consequences.

#### SAVANNAH RIVER SITE—SEISMIC REGULATIONS

*Question.* I understand that new seismic standards have forced the Department to reevaluate the design standard of the Salt Waste Processing Facility at Savannah River Site. This halt in progress will increase project costs and delay the start of this project by 2 years.

Why did this happen?

*Answer.* The Department of Energy (DOE) has established design and performance standards associated with Natural Phenomena Hazards (including seismic) in DOE Guide 420.1–2, Guide for the Mitigation of Natural Phenomena Hazards for DOE Nuclear Facilities and Non-Nuclear Facilities, and DOE Standard 1021–93, Natural Phenomenon Hazards Performance Categorization Guidelines for Struc-

tures, Systems and Components, that are tailored to the hazards associated with our nuclear facilities. Performance Category 3 (PC-3), representing the most stringent earthquake design requirements, is invoked where the highest hazards exist in these types of facilities.

In accordance with the DOE Directives, early in the design of facilities, the performance categorization is determined and the analysis is refined as the safety documentation matures. The Salt Waste Processing Facility (SWPF) preliminary safety analysis and the original facility design were based on a lower performance category determination. However, while addressing issues raised by the Defense Nuclear Facilities Safety Board the Department determined that the PC-3 design requirements would provide greater assurance that confinement of radioactive materials was adequate given the range of hazards.

#### ACCELERATED CLEANUP—CHANGE IN COURSE

*Question.* Last month Secretary Bodman testified that he would not be bound by the commitments by his predecessors regarding funding for Environmental Cleanup. By and large, the funding profile contained in the DOE's 5-year funding plan shows a decline in funding for most of the cleanup activities.

Are we to assume that the Department will reduce funding for environmental cleanup activities, and if so, where and to what end?

*Answer.* As part of the administration's Accelerated Cleanup Initiative, beginning in fiscal year 2003, increased funding was provided to accelerate cleanup and address urgent risks sooner than had been planned. Fiscal year 2005 was the peak year of funding for this initiative. We remain committed to completing the Environmental Management (EM) mission in a manner that protects the environment and public, and is safe for workers, while being fiscally responsible. The Department of Energy will continue to focus on risk reduction and cleanup completion while maintaining balance with other Departmental and national priorities.

*Question.* How will out-year funding reductions impact the schedule for the cleanup at all of the cleanup sites?

*Answer.* The funding levels that had been developed in the 5-Year Plan to support the accelerated site closure strategy were based, in part, on overly optimistic assumptions. The Department of Energy (DOE) is currently updating these assumptions to reflect changes that have taken place in regulatory and statutory requirements, to incorporate lessons learned based on actual program performance, and to incorporate technological and acquisition strategies that have matured, with the goal of meeting the DOE's long-term environmental commitments. When these assumptions are fully updated, we will be in a position to assess potential impacts.

#### WERC/DOE COOPERATIVE AGREEMENT

*Question.* The Department has failed to live up to its commitment to provide funding under the cooperative agreement with WERC. Why is this?

*Answer.* As directed by the Conference Report (109-275) accompanying the fiscal year 2006 Energy and Water Development Appropriations Act (Public Law 109-103), the Department of Energy provided the American Water Works and the Waste Education Research Consortium (WERC) with \$7,000,000 for advanced concept desalination and arsenic treatment research. WERC received \$749,790 of these funds. WERC will also receive the prior year uncosted carryover of \$5,500,000.

#### CLEANUP DELAYS AT K-25

*Question.* I understand the completion date for the ETPP have been delayed from fiscal year 2008 until mid-fiscal year 2009.

Why is this and what impact will this have on the cost of the project?

*Answer.* The current contract calls for physical completion of the East Tennessee Technology Park by September 30, 2008. The Department of Energy is currently reviewing performance against the baseline for this project to determine the cost and schedule impacts associated with numerous factors including, but not limited to, the complexity of the work, safety concerns, unexpected issues, and increased cleanup requirements.

*Question.* Do you need additional funding in fiscal year 2007?

*Answer.* No additional funding in fiscal year 2007 is needed. The Department of Energy is currently reviewing the baseline for this project to determine the cost and schedule impacts, which would provide the basis for any future budget requests.

## GAO REPORT ON TOTAL ENVIRONMENTAL LIABILITIES

*Question.* The GAO reported that the Department's total estimated cleanup responsibilities could exceed the \$180 billion, by as much as \$25 billion.

GAO found that cost significant increase can be attributed to delays in opening up Yucca Mountain and the Department's ability to dispose of high level waste.

Do you agree with the assessment by GAO? Please explain.

*Answer.* Several assumptions made as part of the Department of Energy's (DOE) Accelerated Cleanup initiative were overly optimistic and have not materialized. In addition, we have identified legacy cleanup requirements at several sites that have not been included in prior Office of Environmental Management (EM) work scope, and some key projects have experienced performance issues. As a result, the life-cycle cost of the cleanup program could increase by \$25 billion, as indicated in the Government Accountability Office's report. DOE has established and implemented a more stringent, highly monitored project management program that is making every effort to identify and address unexpected developments in project design, construction, schedule and scope as they emerge.

In addition, the \$180 billion estimate included approximately \$15 billion for high-level waste and spent nuclear fuel disposal at the Yucca Mountain geological repository which was planned to begin receiving shipments from EM in 2010. The DOE estimates that a 5-year delay in opening the Yucca Mountain geological repository could potentially increase costs by as much \$1 billion to EM's total cost for managing waste. The actual amount of this increase would depend on a number of factors, including when EM completes the cleanup of various sites and had the waste at those sites ready for shipment, the need to build additional storage buildings, and added operating costs.

## YUCCA MOUNTAIN FUNDING

*Question.* The 5-year funding profile provided to Congress shows essentially flat funding for this program over this period. In years past, the out-year funding levels were shown to sharply increase during the time period of license application, work on-site preparation, and rail route preparation activities—ordering the steel for the rails alone will be a very costly venture.

Will that level of funding be sufficient to defend a license application and undertake other activities necessary to prepare for construction and operation of the repository?

*Answer.* The 5-Year Plan DOE submitted to Congress contains two scenarios. The scenario using a formula-based approach for out-years in the fiscal year 2007 budget would not allow the Yucca Mountain program to accelerate pre-licensing construction activities. The above-target scenario moves the program forward as quickly as possible.

While there is a flat funding case as you described, the Office of Civilian Radioactive Waste Management also developed "above target" estimates of \$661 million in fiscal year 2008, \$963 million in fiscal year 2009, \$1.07 billion in fiscal year 2010, and \$975 million in fiscal year 2011. The above-target scenario is more consistent with planned construction activities needed to timely develop the repository. The administration is committed to developing Yucca Mountain as a geologic repository. We have made no policy decisions on out-year funding for Yucca Mountain, but I can assure you we will continue to support expeditious development of the repository.

*Question.* If not, do you expect that the out-year budgets will need to be adjusted once a new program schedule is established?

*Answer.* The amounts in the 5-Year Plan for the out-year budget reflect steady progress toward the receipt of a construction authorization for a repository at Yucca Mountain in the near term. However, in order to reach the goal of an operating geologic repository at Yucca Mountain in a timely manner, significant budget increases for the program will be required for construction and operations of both the repository and the rail line in Nevada. The administration has supported legislation calling for funding reform for the program in the form of reclassifying mandatory Nuclear Waste Fund receipts as discretionary offsetting collections, in an amount equal to appropriations from the Fund for authorized waste disposal activities. This will address a technical budgetary problem that has acted as a disincentive to adequate funding.

The Department's legislative proposal, the "Nuclear Fuel Management and Disposal Act" was submitted to Congress after the date of this hearing on April 6, 2006, and contains a provision to implement this funding reform.

YUCCA MOUNTAIN REQUIREMENTS

*Question.* Administration witnesses have consistently testified that it is important to move forward with the Yucca Mountain project regardless of the outcome of the Global Nuclear Energy Partnership (GNEP). One of the reasons relates to defense waste.

How much defense waste is currently planned for permanent disposition at Yucca Mountain?

*Answer.* The Department currently has approximately 2,500 metric tons of defense spent fuel and 10,500 metric tons of defense high-level radioactive waste. Because of the 70,000 metric tons statutory limit, the Department currently plans to dispose of only 7,000 metric tons of defense spent fuel and high-level radioactive waste at Yucca Mountain.

*Question.* Under the current schedule when will this waste be ready for shipment to Yucca?

*Answer.* Each Department of Energy site that manages spent fuel or high-level waste destined for disposal in the repository will need to place the waste into disposable canisters and load them into NRC certified casks. For most sites, this has not yet occurred. These canisters are designed to be transported in NRC certified casks to the repository and be disposed in waste packages at Yucca Mountain. Currently, Savannah River has waste that has been vitrified; Hanford and Idaho have not yet vitrified their waste. Readiness to ship spent nuclear fuel and high-level waste from each site is dependent on site plans and schedules for high-level waste treatment, spent nuclear fuel disposition and packaging activities, and the construction of cask loading facilities. Current plans developed by the Office of Environmental Management for each site are summarized in the table below.

SITE	Date of Capability to Ship HLW Canisters	Date of Capability to Ship SNF Canisters
Savannah River .....	2012	2015
Hanford Site .....	2020	2018
Idaho National Lab .....	2022	2015

*Question.* If Yucca were not available how would this waste be handled?

*Answer.* If a repository were not built, the waste would continue to be stored at the current sites.

YUCCA MOUNTAIN PROGRAM STATUS

*Question.* In the past year, a decision was made to redirect the approach taken to fuel handling at the repository to a “clean” approach utilizing a single canister for transportation, aging and disposal (TAD) package.

Please explain this new approach and its rationale.

*Answer.* We believe that the clean-canistered approach to receiving commercial spent fuel will allow us to greatly simplify the licensing, construction, and operation of the facilities at Yucca Mountain. With a clean-canistered approach personnel will be handling primarily canistered waste, not individual fuel assemblies as previously planned. These canisters will provide another contamination barrier between the worker and the waste. For example, when routine maintenance is required in the canistered operating facilities, workers will not have to deal with radiological contamination as they would with individual fuel assembly handling operations.

The canistered approach will simplify the licensing and construction of the repository, while easing complexities of Yucca Mountain’s post-construction operations. The new approach envisions spent fuel being delivered to Yucca Mountain primarily in transport, aging, and disposal (TAD) canisters which are then placed in a waste package for emplacement. Handling of bare fuel will be limited and will be accommodated by much smaller facilities. Switching to a primarily clean facility plan will improve safety and operations and dramatically improve the overall performance of Yucca Mountain operations.

*Question.* What impact has this redirection had on preparing the license application?

*Answer.* To incorporate the new clean-canistered approach, we have reviewed the existing designs for the repository surface facilities, and have initiated efforts to redesign these facilities to incorporate the benefits that result from the clean-canistered approach. We believe that the redesigned surface facilities will be smaller, less costly, and simpler to design, license, construct and operate. As a result, the Department believes any additional time spent incorporating the clean-canistered

approach will be offset by reductions in the time required to license and construct the repository facilities.

*Question.* Have you analyzed the impact that this redirection could have on the timing and cost of license review, program construction and operations?

Answer. As part of the critical decision process in the Department, the program is required to provide a revised cost and schedule for the program that incorporates the canister approach. That process is expected to be completed and the revised cost and schedule provided to the Secretary this summer.

#### INTERIM STORAGE AND REPROCESSING

*Question.* The Energy and Water Conference report for fiscal year 2006 provided the Department with funding to support the siting selection process of interim storage and reprocessing facilities. Communities would be provided \$5 million to support a site development plan and licensing strategy.

What is the status of this program? When will the Department provide the funding support to these communities, and under what terms?

Answer. DOE issued a request for Expressions of Interest (EOI) in the Federal Register on March 17, 2006, announcing its intention to initiate a competition to conduct site evaluations to aid in selecting one or more sites suitable for development of integrated recycling facilities. The EOI sought information to assist in the preparation of a solicitation for proposals to prepare site evaluation reports. A total of 43 responses were received to the EOI.

The solicitation, planned for spring 2006, will be open to domestic sources, public and private, and will encourage teaming and community involvement. Proposals will be evaluated for 90 days, followed by the selection of those proposals for which funding will be provided to prepare a site evaluation report. Each of the resulting site evaluation reports will be reviewed for potential inclusion as an alternative in the EIS analysis for the GNEP Technology Demonstration Program (TDP). DOE currently intends to solicit proposals only for non-DOE sites, given that information relating to the identification of DOE sites for potential inclusion as alternatives in the GNEP-TDP EIS is already available to the Department. The potential sites will be evaluated, in connection with the EIS process, and DOE currently anticipates that it will make site location decisions in the summer 2008 following completion of the EIS.

To evaluate the potential environmental impacts at candidate sites for the demonstration facilities, DOE has taken steps to initiate the preparation of an EIS for the GNEP-TDP. This process began with a March 22, 2006 Advance Notice of Intent (ANOI) which requested comments from interested parties on the scope of the EIS, reasonable alternatives, and other relevant information. Comments received will be used to develop the Notice of Intent (NOI) and to assist DOE in completing the EIS. The Draft EIS is scheduled to be completed by late spring, 2007 and the Final EIS by late spring, 2008. A Record of Decision (ROD) is expected to be issued in summer 2008.

#### YUCCA MOUNTAIN—LICENSE APPLICATION

*Question.* Secretary Bodman testified that the Department anticipates providing a new schedule for license application and repository operations by early summer. The budget justification materials indicate that among the tasks to be accomplished in fiscal year 2007 is defending a license application to the NRC.

Does the budget request assume that a license application will occur in fiscal year 2007, and if not, would the request need to be adjusted?

Answer. No. The fiscal year 2007 budget request does not assume the license application will be submitted in fiscal year 2007 and accordingly does not need to be adjusted. The license defense activities in fiscal year 2007 relate to preparation of the license application, and include identifying and preparing information in an acceptable format to submit to the Nuclear Regulatory Commission (NRC) electronic hearing docket, which is an electronic information system that will receive, distribute, store and retrieve docket materials for licensing and proceedings. It also includes identification of expert witnesses and preparation of information that may be needed to respond to contentions raised by other parties to the licensing proceedings. Prior to submitting the license application, the Department plans to have in place procedures and processes to respond to NRC's requests for additional information once the license application is submitted. Recognizing that the NRC staff is only planning an 18-month review period prior to the hearings, the Department needs to be able to respond to Requests for Additional Information rapidly and comprehensively. A thorough legal and regulatory review process, combined with timely interactions with the NRC during the pre-application period, will help the program

develop a license application that the NRC can docket, review and adjudicate in the 3-year period required by the Nuclear Waste Policy Act.

*Question.* What is the Department's current estimate for the cost of the rail line to Yucca Mountain?

*Answer.* The current estimate is approximately \$2 billion for the life cycle cost of the rail line to Yucca Mountain. The estimate is specific to the Caliente rail corridor and includes the cost of facilities related to rail operations. These facilities include sidings and basic maintenance capability where the Nevada rail line connects to existing mainline track, maintenance-of-way facilities along the track and an end-of-line facility proximate to the repository. The Department believes the cost of constructing rail access to the repository along the Caliente corridor is still viable based on these considerations, but is reviewing its ability to reduce the costs.

#### YUCCA MOUNTAIN REPOSITORY OPERATIONS

*Question.* Some degree of aging of fuel at the site before emplacement in the repository has always been assumed.

What is your current thinking on fuel aging at Yucca and how might it be accomplished?

*Answer.* Currently, our plans for spent fuel aging at Yucca Mountain include several large above-ground aging pads. With the program's change to the clean-canistered approach for transport, aging and disposal (TAD) of spent fuel, it is expected that TAD-based storage systems will be used for most of the required spent fuel aging. We currently expect the license application will provide for aging capacity in the range of 20,000 to 40,000 metric tons.

*Question.* Could the duration of fuel aging be influenced by developments with GNEP?

*Answer.* Repository designs have consistently included aging capability needed to allow the spent fuel received from the utility sites to cool until it is suitable for permanent underground disposal. These aging facilities are an integral part of our disposal operations. Although Global Nuclear Energy Partnership (GNEP) offers the promise of development of recycling technologies over the next several decades, there are no current plans to store existing spent fuel inventories for possible recycling in the future. If commercial GNEP technologies are proven feasible and eventually developed, repository operations may need to be adjusted, as appropriate, to incorporate the benefits for future inventories of spent fuel that GNEP processing might provide.

#### YUCCA MOUNTAIN CAPACITY

*Question.* Yucca Mountain currently has a legislated capacity limit of 70,000 metric tons as set forth by the Nuclear Waste Policy Act.

Based on technical factors alone, what is the physical capacity of Yucca to accommodate spent fuel?

*Answer.* The environmental impact statement for the Yucca Mountain repository in its cumulative impacts section evaluated the disposal of approximately 120,000 metric tons of spent nuclear fuel and high-level waste. However, the actual physical capacity of Yucca Mountain exceeds that amount. The Department believes the physical capacity of Yucca Mountain is at least adequate to dispose of the commercial and DOE spent fuel and high-level waste that currently exists, and could provide for the disposal of all the spent nuclear fuel from the existing suite of nuclear plants with life extensions.

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#### QUESTIONS SUBMITTED BY SENATOR THAD COCHRAN

*Question.* Mr. Chairman, I appreciate your holding this hearing to review budgets of the Department of Energy's Office of Science, Office of Nuclear Energy, Office of Fossil Energy, Office of Environmental Management as well as many other important accounts with the Department of Energy. I want to join you in thanking the witnesses for being here to provide testimony and answer questions.

I am pleased that the Department is continuing to look for alternate and renewable sources of energy to correct the trend toward unnecessary reliance on foreign sources of oil and gas. My State continues to conduct research to develop cleaner and more efficient sources of energy. After Hurricane Katrina, fuel costs rose as much as \$3 per gallon and finding diesel to transport necessities or to run the electrical generators used to cool poultry production facilities became a challenge. Our biodiesel suppliers provided this needed fuel which proved not only to be a cleaner fuel, but a fuel that is a substitute for foreign oil.

Mr. Chairman, I look forward to working with you this year on these important accounts as well as the new American Competitiveness Initiative and the Advanced Energy Initiative.

It is important to implement a regional approach to biomass research because of the diversity of sources in the United States. Biomass sources and techniques in Mississippi are much different than the biomass opportunities available in the Midwest.

How do you perceive the Department's role in facilitating a regional approach to research and development?

Answer. The Department has requested funding in fiscal year 2007 to implement the concept of regional feedstock development partnerships. We agree that the opportunities for biomass feedstocks development are best approached regionally, because differences in soils, rainfall, climate, agricultural land-use patterns, and established markets exist at a regional level. Partnerships are needed because of the complexity of feedstock issues that include basic and applied science to develop the feedstock resources, infrastructure feedstock needs for biorefineries including reliability, availability, and cost; and sustainability issues as they pertain to resource development. Partnership efforts will bring Federal funding together with the biofuels production industry with the grower community and university researchers to better define the actual resource on a regional and local basis.

#### LOAN GUARANTEE

*Question.* One of the important loan guarantee programs authorized under the Energy Policy Act of 2005 would encourage the commercialization of projects which reduce air pollutants as well as employ improved technologies in many areas such as renewable energy systems, carbon capture, and advanced fossil energy technology. I understand that the Department has not asked for funding for the loan guarantee program or demonstration project authorized under Title 17.

What is the Department's view of this program and why was funding not requested this year?

Answer. The Department of Energy (DOE) is working to meet the Secretary's previously-stated goal of accepting the first preliminary applications for "self-pay" loan guarantees under Title XVII before the end of fiscal year 2006. We are proceeding, but we are doing so with no small measure of caution and prudence. The Department has established a small loan guarantee office under the Department's Chief Financial Officer. In implementing the program, we will follow the Federal Credit Reform Act of 1990 (FCRA) and Office of Management and Budget (OMB) guidelines, and we will emulate "best practices" of other Federal agencies. Toward that end, we are drafting program policies and procedures, establishing a credit review board, and are planning to employ outside experts.

Title XVII authorizes DOE to issue loan guarantees for projects that avoid, sequester, or reduce air pollutants and/or anthropogenic emissions of greenhouse gases, and "employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." Section 1703(b) lists some specific categories of projects that are eligible for these loan guarantees. Title XVII allows for project developers to pay the subsidy cost of loan guarantees issued by DOE. While this "self-pay" mechanism may reduce the need for appropriations, it is possible that the ultimate cost to the taxpayer could be significantly higher than the cost of the subsidy cost estimate. To minimize this possibility, DOE's evaluations of applications will entail rigorous analysis and careful negotiation of terms and conditions.

FCRA contains a requirement that prevents us from issuing a loan guarantee until we have authorization to do so in an appropriations bill. We do not believe we have authority to proceed with an award absent having the necessary explicit authorization in an appropriations bill.

*Question.* What type of interest from researchers and the public has the Department received regarding this newly authorized program?

Answer. The loan guarantee provisions in the Energy Policy Act of 2005 are generating a great deal of interest. The Department regularly receives questions about every aspect of the loan guarantee program from prospective project sponsors and other constituencies. The topics of these questions range from the application and transaction closing processes to the criteria for eligible projects.

*Question.* Has the Department received applications, from whom, and for what projects? If not, when will the DOE be accepting applications for "self-pay" loan guarantees, and how long does DOE anticipate it will take to process an application?

Answer. Although the Department has received many inquiries about loan guarantees, DOE has not received any applications for loan guarantees.

The Department of Energy (DOE) is working to meet the Secretary's previously stated goal of accepting the first preliminary applications for "self-pay" loan guarantees under Title XVII before the end of fiscal year 2006. We are proceeding, but we are doing so with no small measure of caution and prudence. The Department has established a small loan guarantee office under the Department's Chief Financial Officer. In implementing the program, we will follow the Federal Credit Reform Act of 1990 (FCRA) and Office of Management and Budget (OMB) guidelines, and we will emulate "best practices" of other Federal agencies. Toward that end, we are drafting program policies and procedures, establishing a credit review board, and are planning to employ outside experts.

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FCRA contains a requirement that prevents us from issuing a loan guarantee until we have authorization to do so in an appropriations bill. We do not believe we have authority to proceed with an award absent having the necessary explicit authorization in an appropriations bill.

*Question.* In working with Fischer-Tropsch technologies, does the Department have suggestions on how to provide government assistance to those companies who are interested in commercializing this technology?

Answer. The Department of Energy (DOE) completed its successful RD&D program on coal-to-liquids including related Fischer-Tropsch (FT) technologies several years ago. The Energy Policy Act of 2005 (EPAct 2005) authorizes new DOE and other assistance (e.g., investment tax credits) to early commercial projects that employ FT technologies, including loan guarantees under Title XVII.

The Department is working to meet the Secretary's previously-stated goal of accepting the first preliminary applications for "self-pay" loan guarantees under Title XVII before the end of fiscal year 2006. We are proceeding, but we are doing so with no small measure of caution and prudence. The Department has established a small loan guarantee office under the Department's Chief Financial Officer. In implementing the program, we will follow the Federal Credit Reform Act of 1990 (FCRA) and Office of Management and Budget (OMB) guidelines, and we will emulate "best practices" of other Federal agencies. Toward that end, we are drafting program policies and procedures, establishing a credit review board, and are planning to employ outside experts.

Title XVII authorizes DOE to issue loan guarantees for projects that avoid, sequester, or reduce air pollutants and/or anthropogenic emissions of greenhouse gases, and "employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued." Section 1703(b) lists some specific categories of projects that are eligible for these loan guarantees. Title XVII allows for project developers to pay the subsidy cost of loan guarantees issued by DOE. While this "self-pay" mechanism may reduce the need for appropriations, it is possible that the ultimate cost to the taxpayer could be significantly higher than the cost of the subsidy cost estimate. To minimize this possibility, DOE's evaluations of applications will entail rigorous analysis and careful negotiation of terms and conditions.

FCRA contains a requirement that prevents us from issuing a loan guarantee until we have authorization to do so in an appropriations bill. We do not believe we have authority to proceed with an award absent having the necessary explicit authorization in an appropriations bill.

#### VEHICLE PROGRAMS

*Question.* The fiscal year 2007 budget request for Energy Supply and Conservation Accounts supports development of a number of new energy technologies, including programs that fund basic and applied research, development, demonstration, and technical assistance. These efforts promote the deployment of new technologies needed to support both Hybrid Electric and Fuel Cell vehicle development under the

FreedomCAR program. Lightweight materials, electronic power control, electric drive motors, and advanced energy storage devices are specifically identified in the fiscal year 2007 budget as areas where Federal R&D investment seeks to achieve technology breakthroughs.

Is it fair to state that the United States has fallen behind its global competitors in the race to develop the next generation of Hybrid Electric Vehicles (HEV) to meet projected consumer demand? How far behind is the United States in developing next generation HEVs that will ensure our competitiveness in this market?

Answer. No, we do not believe that the United States is lagging behind any country from a next-generation perspective. The fiscal year 2007 presidential request re-allocated vehicle funding program resources to increase focus on plug-in hybrid electric vehicle research. Our technological goals are ambitious, and progress to date is good. We have seen pre-competitive advances in the reduction in the cost of the next generation of batteries, as well as improvements in the cost and performance of other essential components of HEVs. Other indicators of progress include advances in the nickel metal hydride battery developed through DOE-sponsored R&D. Work is underway to develop the high energy batteries for plug-in HEVs, expected to keep the United States dominant in this key area.

There is also a need to reduce the cost of HEV technology to increase consumer acceptance. A recent poll indicated that over 50 percent of the American public desires HEVs, but believes they are too costly (based on a telephone poll of 1,001 adults conducted March 10–12 and released April 10 by CNN/USA Today/Gallup). The FreedomCAR 2010 technology targets aim to resolve the issue of cost barriers. This goal is shared by industry; for example, Toyota recently announced an effort to reduce their HEV component costs by two-thirds in the same time frame.

*Question.* Electronic power control is one of the activities for which R&D investment has been targeted under the FreedomCAR program. Has the program identified and documented the technical approaches that have the most potential to provide radical improvements or “breakthroughs” in electronic power control for next generation HEVs? If so, what are the potential breakthrough technologies?

Answer. We have identified and documented the technical approaches for the next generation of hybrid electric vehicles (HEVs), and feel the potential breakthrough technologies for high-temperature operation include wide bandgap materials, advanced packaging, and high-temperature capacitors. Silicon Carbide (SiC) is the only wide bandgap material currently available to produce useable power devices. Ongoing research and development efforts are focused on these technologies. In fiscal year 2007 we anticipate funding efforts to build an all SiC inverter and a high-temperature DC/DC converter. A new solicitation is also planned in fiscal year 2007 to seek other alternative, high-temperature technologies.

*Question.* Which of these potential breakthrough technologies in electronic power controls have the greatest potential to accelerate U.S. efforts to develop the next generation HEVs?

Answer. The FreedomCAR and Fuel Partnership’s Electrical and Electronics Technical Team has identified the cost, weight, and volume targets and reliability requirements to help make HEVs a cost-competitive choice for consumers. Meeting these targets would require improvements over current technologies to reduce weight and volume by a factor of two and cost by a factor of four. Power electronics capable of operating at ambient temperatures of 200° C would likely require silicon carbide (SiC) devices, and high-temperature packaging to enable high-temperature operation. These technologies are the highest priority research need for the next generation HEVs. The fiscal year 2007 budget supports continued research to address these challenges.

*Question.* Would the successful development of air-cooled vehicle-class power electronics at a vastly accelerated pace provide the kind of “breakthrough” that would allow the United States to catch up with our global competitors? If so, what are the most promising and highest priority technologies for air-cooled vehicle-class power electronics to which additional investment should be targeted?

Answer. Air-cooled power electronics offer the potential to meet the targets and requirements for size, weight, cost, volume, and reliability to make hybrid electric vehicles (HEVs) an economic choice for large numbers of consumers. Simply accelerating the pace of power electronics development is not the only technology breakthrough required to successfully market this technology. Automakers have yet to demonstrate air-cooled HEV technologies for high-power traction drives in consumer vehicles. Success in this area would allow an automobile manufacturer to leap-frog current HEV vehicles.

The most promising and highest priority technologies in sequential order are air-cooled inverters, high-temperature DC/DC converters, and the functional integration of inverters and converters to allow sharing of components. The fiscal year 2007

budget request will fund research and development efforts to build an all-silicon carbide (SiC) inverter and a high-temperature converter. Research and development of the functional integration of a high-temperature inverter/converter is planned for fiscal year 2007.

*Question.* Has Wide Bandgap Silicon Carbide technology been identified as a potential breakthrough technology for air-cooled vehicle-class power electronics? If so, what would its successful insertion into the air-cooled vehicle-class power electronics program mean for the United States in the global competition?

*Answer.* Yes, wide bandgap technology, such as silicon carbide (SiC), is one of several enabling technologies required to achieve a breakthrough in air-cooled power electronics for hybrid electric vehicles (HEVs), plug-in hybrid vehicles, and fuel cell vehicles. Current HEV technologies exceed the weight and volume targets by a factor of two, and exceed the cost target by a factor of four. Success with SiC technology alone, however, will not guarantee successful development of cost effective air-cooled devices. An air-cooled inverter offers the potential to reduce the size and weight of an inverter by 75 percent when compared to the current HEV technology. It also offers the potential for the inverter to meet the FreedomCAR cost target, with greatly improved reliability.

*Question.* What are your internal estimates of the potential, in terms of accelerating the schedule, if this technology were successfully demonstrated as an R&D breakthrough in the air-cooled vehicle-class power electronics? Would 3 to 5 years be a reasonable estimate? Does the current budget for "electronic power control" R&D provide sufficient funding to evaluate the potential breakthrough technologies, such as Wide Bandgap Silicon Carbide, that may provide the greatest potential for restoring U.S. leadership in the development of next generation HEVs?

*Answer.* The current budget for power electronics research and development provides sufficient funding to evaluate, research, and develop the technologies necessary for the next generation of hybrid electric vehicles (HEVs), including those required for high-temperature operation such as silicon carbide (SiC). The potential to accelerate the schedule and produce technology solutions in a 3- to 5-year period exists due to the combined government and industry efforts to advance SiC and other high-temperature components and devices required for next generation HEVs. There is increasing interest among firms that produce and use SiC devices in power electronics, and it is highly likely that the development schedule could be accelerated by appropriate teaming of suppliers, national laboratories, universities, and U.S. automakers. The DOE FreedomCAR and Fuel Partnership solicitation planned for late fiscal year 2006 is intended to stimulate the formation of such teams.

*Question.* Given the growing consumer acceptance for HEVs and the global competition in the HEV marketplace, has the FreedomCAR program assessed what it will mean to the United States, if we fail to regain our leadership in the critical R&D needed for the next generation of HEVs? Is there a concern that it will leave North American automotive manufacturing uncompetitive in price and technology?

*Answer.* Achievement of the 2010 FreedomCAR goals and the program's subsequent R&D will help assure that our domestic industry partners can successfully compete in both the United States and the world markets. One central objective of our 2010 goals is reducing the cost of HEV components so that the vehicle manufacturing cost allows them to be offered at prices competitive with standard vehicles.

*Question.* Please provide estimates of the additional Federal R&D investment that would be required to insert the highest priority potential breakthrough technologies for Advanced Power.

*Answer.* The Department's fiscal year 2007 budget request provides adequate funding to support research and development of hybrid electric and fuel cell propulsion technologies under the FreedomCAR and Fuel Partnership Program. It has been appropriately apportioned to address the technology challenges associated with the development of next generation hybrid electric vehicles (HEVs) with wide consumer acceptance.

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QUESTION SUBMITTED BY SENATOR CHRISTOPHER S. BOND

*Question.* Mr. Garman, in response to my question to you regarding the administration's cuts to the Clean Coal Power Initiative (CCPI), you indicated that the Department of Energy had \$500 million in un-obligated funds available. Where, specifically, in the Department of Energy are these un-obligated funds? What account? And, once identified, will the administration ask that these funds be re-programmed to the CCPI and other commitments in the President's Advanced Coal Research Initiative?

Answer. The un-obligated funds are in the CCPI and the original Clean Coal Technology Demonstration accounts and represent funds that have been formally committed to projects competitively selected under CCPI (and the predecessor programs, namely the Clean Coal Technology Demonstration and the Power Plant Improvement Initiative programs) that are either in negotiations for awards or projects that have been awarded but have not yet been completed. The structure of CCPI projects is such that some amount of un-obligated funds remains on projects until they enter their final budget phase. The Department is working to withdraw funds from projects in the CCPI and Clean Coal Technology accounts that are not going forward. The Department is also working to change CCPI contract provisions and other processes to strengthen its ability in the future to withdraw funds from stalled projects. If a project does not go forward and the Department withdraws funds, then the available funds will be put towards a future CCPI solicitation.

QUESTIONS SUBMITTED BY SENATOR WAYNE ALLARD

*Question.* Last year Congress passed legislation, at my request that authorized the Secretary of Energy to purchase essential mineral rights at Rocky Flats. This authority was provided for 1 year. I understand that minimal progress has been made so far.

What is the Department of Energy's plan for purchasing the essential mineral right at Rocky Flats? When do you expect this transaction to be completed?

Answer. The Department of Energy (DOE), in partnership with the U.S. Fish and Wildlife Service (USFWS) and Natural Resources Trustees (Trustees), has established and is currently executing a plan for purchasing the essential mineral rights at Rocky Flats.

The acquisition strategy for the mineral rights will be conducted in two phases. First, the Trust for Public Lands (TPL), a nonprofit group specializing in real estate acquisitions for Federal Government entities, will purchase the mineral rights from willing owners at fair market value, and will perform any appraisal updates required. In the second phase, these rights will be purchased by the DOE, with the funds provided in the Energy and Water Development Appropriations Act for Fiscal Year 2006.

At this time, TPL, DOE, and USFWS are finalizing a letter of agreement, stipulating the process for contacting willing sellers and ascertaining fair market values.

DOE and the USFWS fully expect to accomplish the acquisition of mineral rights well within the timeline mandated by Congress, and in harmony with the local stakeholder community.

*Question.* With regard to Environmental Management funding, why didn't the Department of Energy take the money it saved at Rocky Flats and use it to accelerate clean-up at other sites?

Answer. Prior to fiscal year 2001, the Department of Energy's (DOE) Environmental Management funding strategy was that as sites such as Rocky Flats completed cleanup, and their funding requirements decreased, those savings would be made available to other sites. However, beginning in fiscal year 2003, as part of the administration's Accelerated Cleanup Initiative, increased funding was provided to accelerate cleanup at most sites, rather than waiting until cleanup at sites such as Rocky Flats was completed. This allowed the DOE to address its urgent risks sooner and to accelerate cleanup.

*Question.* To what extent is DOE using contract mechanisms similar to those used at Rocky Flats to incentivize the contractor to achieve greater performance? What can we do to further encourage the accelerated clean-up of other sites?

Answer. The contract mechanisms used at Rocky Flats were part of a successful three-pronged management strategy. The first element used contract devices designed to provide incentives to the contractor to complete site closure within targeted costs and schedules. Second, it included application of innovative technologies and development of regulatory agreements that focused on end states. Third, it involved extensive stakeholder participation. The Department of Energy (DOE) currently is using the same elements employed at Rocky Flats for the Mound, Fernald, Columbus, and Oak Ridge projects.

The DOE is using its lessons learned from the Rocky Flats project to accelerate cleanup efforts at its other sites. It is transferring Rocky Flats personnel to support closure at other sites and is providing lessons-learned seminars to managers at other sites. The DOE also developed and is widely disseminating lessons-learned documents and a digital video disk explaining its cleanup and closure successes. The DOE continues to examine its cleanup work at each of the Environmental Management sites to identify areas where an accelerated approach is feasible.

The former Rocky Flats weapons contractors (Dow and Rockwell) and the property owners near Rocky Flats have been engaged in a protracted legal battle over whether these property owners should be compensated for the damage caused by the environmental contamination at Rocky Flats. Last February, a jury awarded the property owners an incredible sum of over \$550 million in damages. I understand the contractors are now appealing this decision. It seems to me that only people who are benefiting from this battle are the lawyers who so far have taken \$100 million in legal fees. And, because Dow and Rockwell are indemnified by the Federal Government, the real losers are the American taxpayers.

*Question.* To what extent is DOE trying to settle this case? Is there any evidence that suggests that these properties suffered extensive contamination?

*Answer.* An appeal has not yet been filed in this case because a judgment has not yet been entered. One reason for that is that the jury's verdict needs to be adjusted by the court to eliminate duplicative damages and punitive damages that are in excess of what Colorado law allows. When a judgment is entered, it should be for substantially less than the \$550 million figure that has been reported. It is also not the case that the legal fees that have so far been incurred in this litigation amount to \$100 million. That said, this litigation has clearly already been very costly for the American taxpayers, and if an adverse judgment were to be upheld on appeal the taxpayers will be, as your question says, the "real losers." Prior to the trial in this case we were advised that the plaintiffs would be willing to consider settling their claims for approximately \$100 million. We believed then that a settlement anywhere near that amount could not be justified and, notwithstanding the jury's verdict, that remains our view. In part, this is because there is no evidence that properties in the vicinity of Rocky Flats suffered extensive contamination. Just last year the Agency for Toxic Substances and Disease Registry (ATSDR) issued a report concluding that the "studies and sampling data generated by numerous parties, including the U.S. Environmental Protection Agency (EPA), the Colorado Department of Public Health and Environment (CDPHE), the U.S. Department of Energy (DOE) and its contractors and local community groups, universities and private researchers . . . paint a consistent picture of the public health implications of environmental contamination" near Rocky Flats, and that picture is that "past, current and future exposures are below levels associated with adverse health effects." In fact, ATSDR reported that "estimated total exposures to radiation from the soil . . . are 3,000 times lower than the average exposures to ionizing radiation experienced by United States residents."

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#### QUESTIONS SUBMITTED BY SENATOR MITCH MCCONNELL

*Question.* In fiscal year 2005, this committee generously approved my request to increase funding for cleanup at the Paducah Gaseous Diffusion Plant to accelerate the disposal of legacy waste and decommissioning activities at the site. Can you update the committee on how those funds have been used and what progress has been made in accelerating these projects?

*Answer.* The following progress has been realized to date at the Paducah Gaseous Diffusion Plant:

##### *Legacy Waste Disposal Acceleration*

The Department of Energy (DOE) disposed of more than 1,900 drums (over 1,000,000 pounds) of stored uranium by-products in fiscal year 2006, accelerating this action by more than 2 years.

DOE accelerated by 3 years the disposal of more than 24,000 cubic feet of low-level radioactive waste which is stored outside.

##### *Decontamination and Decommissioning (D&D) Acceleration*

The C-410-A Hydrogen Holder Tank has been completely removed, 8 years ahead of the original schedule.

The characterization and disposal of waste located in three DOE Material Storage Areas (DMSA) is ahead of the original schedule and is expected to be completed in fiscal year 2006. More than 80 percent of the targeted waste has been processed and the outside DMSA has been completely emptied.

The C-603 Nitrogen Facility removal is complete with the exception of a small amount of residual waste. This project was accelerated by approximately 5 years.

The C-402 Lime House removal is on schedule for completion in fiscal year 2006, 2 years early. A streamlined regulatory approval process was implemented in cooperation with the State and Federal regulators.

A project to remove the C-405 Incinerator is undergoing final regulatory approval with actual decontamination and decommissioning (D&D) scheduled to begin in late

fiscal year 2006 and be completed in fiscal year 2007. This schedule is an acceleration of approximately 3 years.

DOE is also working to get final approval from the regulators to remove the C-746-A West-End Smelter. The D&D should begin in early fiscal year 2007 and will be complete in fiscal year 2007, 2 years ahead of schedule.

I remain concerned by the continuing delays in the construction of the Depleted Uranium Hexafluoride (DUF<sub>6</sub>) conversion facility at the Paducah Gaseous Diffusion Plant. Congress has twice enacted legislation I authored to make sure this project moves forward in a safe and expeditious manner. This committee has met or exceeded funding requests for this project in each fiscal year. Yet in its fiscal year 2007 budget justification, DOE again pushes the construction completion date back to November of 2007 and to start operations in the spring of 2008.

*Question.* What are the reasons for the delays? What assurances can the Department offer this committee that it will be able to meet this deadline? Given that one of the deadlines DOE has met on this project was the statutory deadline to begin construction by July 31, 2004, does Congress need to legislate a mandatory date for start of operations?

*Answer.* On September 30, 2005, the Deputy Secretary approved the Project Performance Baseline and Start of Construction for the depleted uranium hexafluoride (DUF<sub>6</sub>) project with commencement of operations projected for April 2008. Previous schedules were based on conceptual and preliminary designs that had not been validated by the Department of Energy (DOE), unlike the current approved schedule which is based upon the final conversion facility design. The need to adjust the original schedule reflects the considerable uncertainty associated with large construction projects during early design stages. DOE has high confidence in the new schedule now that the design is complete. The schedule includes 4 months of schedule extension necessary to incorporate design and fabrication activities to achieve greater assurance of safety for chemical operations during natural phenomena events, such as earthquakes or high wind events. The schedule also includes 5 months of contingency to account for unexpected events, to give DOE the confidence in our commitment to this approved baseline. Schedule contingency was not included in previous schedules.

Since approval of the Project Baseline in September 2005, we have seen continuous progress at the site, including construction of the conversion buildings and steady progress on the warehouse/maintenance and administration buildings. The major construction is more than 35 percent complete. Equipment procurement contracts for about 75 percent of the major equipment have been awarded, totaling more than \$70 million. In addition, approximately \$60 million in subcontracts for construction and fabrication have been awarded to date. We are committed to our schedule, and to commence operations in a manner that is safe and protective of the community.

*Question.* Like many members of the Paducah community, I am concerned about the economic impact of the plant possibly ceasing enrichment operations in 2010. In its fiscal year 2007 budget justification, DOE notes that portions of the Paducah site "will be used to promote the development of private-sector enterprises in ways that are consistent with and complementary to current site missions". Given that the Paducah has a skilled workforce and an acceptance of nuclear operations not found in other parts of the country, has the Department identified what those sorts of "private-sector enterprises" might be?

*Answer.* The Department of Energy (DOE) is not conducting re-industrialization activities at the Paducah site. The availability of this large cleaned-up industrial site is expected to be promoted as an attractive resource by the community in its long-term industrial development after DOE has completed cleanup. DOE anticipates that its final cleanup activities will support future community private sector development initiatives.

#### SUBCOMMITTEE RECESS

Mr. GARMAN. Thank you, Mr. Chairman.

Senator DOMENICI. We stand in recess.

[Whereupon, at 12:03 p.m., Thursday, March 30, the subcommittee was recessed, to reconvene subject to the call of the Chair.]