AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

PRIORITIES IN THE DEPARTMENT OF ENERGY BUDGET FOR FISCAL YEAR 2005

HEARING

BEFORE THE

SUBCOMMITTEE ON ENERGY

COMMITTEE ON SCIENCE

HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTH CONGRESS

SECOND SESSION

MARCH 24, 2004

Serial No. 108–50

Printed for the use of the Committee on Science

Available via the World Wide Web: http://www.house.gov/science

U.S. GOVERNMENT PRINTING OFFICE

92–615PS WASHINGTON : 2004

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
Fax: (202) 512–2250 Mail: Stop SSOP, Washington, DC 20402–0001

COMMITTEE ON SCIENCE

HON. SHERWOOD L. BOEHLERT, New York, *Chairman*

RALPH M. HALL, Texas
LAMAR S. SMITH, Texas
CURT WELDON, Pennsylvania
DANA ROHRABACHER, California
KEN CALVERT, California
NICK SMITH, Michigan
ROSCOE G. BARTLETT, Maryland
VERNON J. EHLERS, Michigan
GIL GUTKNECHT, Minnesota
GEORGE R. NETHERCUTT, JR., Washington
FRANK D. LUCAS, Oklahoma
JUDY BIGGERT, Illinois
WAYNE T. GILCHREST, Maryland
W. TODD AKIN, Missouri
TIMOTHY V. JOHNSON, Illinois
MELISSA A. HART, Pennsylvania
J. RANDY FORBES, Virginia
PHIL GINGREY, Georgia
ROB BISHOP, Utah
MICHAEL C. BURGESS, Texas
JO BONNER, Alabama
TOM FEENEY, Florida
RANDY NEUGEBAUER, Texas
VACANCY

BART GORDON, Tennessee
JERRY F. COSTELLO, Illinois
EDDIE BERNICE JOHNSON, Texas
LYNN C. WOOLSEY, California
NICK LAMPSON, Texas
JOHN B. LARSON, Connecticut
MARK UDALL, Colorado
DAVID WU, Oregon
MICHAEL M. HONDA, California
BRAD MILLER, North Carolina
LINCOLN DAVIS, Tennessee
SHEILA JACKSON LEE, Texas
ZOE LOFGREN, California
BRAD SHERMAN, California
BRIAN BAIRD, Washington
DENNIS MOORE, Kansas
ANTHONY D. WEINER, New York
JIM MATHESON, Utah
DENNIS A. CARDOZA, California
VACANCY
VACANCY
VACANCY

SUBCOMMITTEE ON ENERGY

JUDY BIGGERT, Illinois, *Chair*

RALPH M. HALL, Texas
CURT WELDON, Pennsylvania
ROSCOE G. BARTLETT, Maryland
VERNON J. EHLERS, Michigan
GEORGE R. NETHERCUTT, JR., Washington
W. TODD AKIN, Missouri
MELISSA A. HART, Pennsylvania
PHIL GINGREY, Georgia
JO BONNER, Alabama
SHERWOOD L. BOEHLERT, New York

JOHN B. LARSON, Connecticut
NICK LAMPSON, Texas
JERRY F. COSTELLO, Illinois
LYNN C. WOOLSEY, California
DAVID WU, Oregon
MICHAEL M. HONDA, California
BRAD MILLER, North Carolina
LINCOLN DAVIS, Tennessee
BART GORDON, Tennessee

KEVIN CARROLL *Subcommittee Staff Director*
TINA M. KAARSBERG *Republican Professional Staff Member*
CHARLES COOKE *Democratic Professional Staff Member*
JENNIFER BARKER *Staff Assistant*
KATHRYN CLAY *Chairman's Designee*

CONTENTS

March 24, 2004

	Page
Witness List	2
Hearing Charter	3

Opening Statements

Statement by Representative Judy Biggert, Chairman, Subcommittee on Energy, Committee on Science, U.S. House of Representatives	14
Written Statement	15
Statement by Representative John B. Larson, Ranking Minority Member, Subcommittee on Energy, Committee on Science, U.S. House of Representatives	16
Written Statement	17

Witnesses:

Dr. James F. Decker, Principal Deputy Director of the Office of Science, U.S. Department of Energy	
Oral Statement	18
Written Statement	19
Biography	26
Mr. David Garman, Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy	
Oral Statement	27
Written Statement	28
Biography	34
Mr. Mark R. Maddox, Acting Assistant Secretary for Fossil Energy, U.S. Department of Energy	
Oral Statement	35
Written Statement	37
Biography	40
Mr. William D. Magwood, IV, Director of the Office of Nuclear Energy, Science, and Technology, U.S. Department of Energy	
Oral Statement	41
Written Statement	42
Biography	47
Mr. James W. Glotfelty, Director of the Office of Electric Transmission and Distribution, U.S. Department of Energy	
Oral Statement	47
Written Statement	49
Biography	51
Discussion	52

Appendix: Answers to Post-Hearing Questions

Dr. James F. Decker, Principal Deputy Director of the Office of Science, U.S. Department of Energy	76
Mr. David Garman, Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy	78
Mr. Mark R. Maddox, Acting Assistant Secretary for Fossil Energy, U.S. Department of Energy	80

Page

Mr. William D. Magwood, IV, Director of the Office of Nuclear Energy, Science, and Technology, U.S. Department of Energy 105

Mr. James W. Glotfelty, Director of the Office of Electric Transmission and Distribution, U.S. Department of Energy 108

PRIORITIES IN THE DEPARTMENT OF ENERGY BUDGET FOR FISCAL YEAR 2005

WEDNESDAY, MARCH 24, 2004

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON ENERGY,
COMMITTEE ON SCIENCE,
Washington, DC.

The Subcommittee met, pursuant to call, at 10:05 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Judy Biggert [Chairman of the Subcommittee] presiding.

COMMITTEE ON SCIENCE
SUBCOMMITTEE ON ENERGY
U.S. HOUSE OF REPRESENTATIVES

Priorities in the Department of Energy Budget for Fiscal Year 2005

Wednesday, March 24, 2004

10:00 AM – 12:00 PM
2318 Rayburn House Office Building

Witness List

Dr. James Decker
Principal Deputy Director of the Office of Science
The Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Mr. David Garman
Assistant Secretary for Energy Efficiency and Renewable Energy
The Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Mr. Mark Maddox
Acting Assistant Secretary for Fossil Energy
The Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Mr. William Magwood
Director of the Office of Nuclear Energy, Science and Technology
The Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Mr. James W. Glotfelty
Director of the Office of Electric Transmission and Distribution
The Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Section 210 of the Congressional Accountability Act of 1995 applies the rights and protections covered under the Americans with Disabilities Act of 1990 to the United States Congress. Accordingly, the Committee on Science strives to accommodate/meet the needs of those requiring special assistance. If you need special accommodation, please contact the Committee on Science in advance of the scheduled event (3 days requested) at (202) 225-6371 or FAX (202) 225-0891.
Should you need Committee materials in alternative formats, please contact the Committee as noted above.

HEARING CHARTER

SUBCOMMITTEE ON ENERGY
COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES

Priorities in the Department of Energy Budget for Fiscal Year 2005

WEDNESDAY, MARCH 24, 2004
10:00 A.M.—12:00 P.M.
2318 RAYBURN HOUSE OFFICE BUILDING

1. Purpose

On Wednesday, March 24, 2004, the Energy Subcommittee of the House Science Committee will hold a hearing on the Department of Energy's fiscal year 2005 budget request. Five Department of Energy (DOE) witnesses will review the proposed research and development (R&D) budgets and clarify the President's energy-related science and technology priorities.

2. Witnesses

- **Dr. James Decker** is the Principal Deputy Director of the Office of Science (SC) at DOE. He has held this position since 1985, and has concurrently served as Acting Director on five separate occasions. Prior to joining DOE in 1973, Dr. Decker was a physicist at Bell Telephone [AT&T Bell] Laboratories.
- **Mr. David Garman** is the Assistant Secretary for Energy Efficiency and Renewable Energy (EERE) at DOE. Previously, Mr. Garman served as Chief of Staff to former Senator Frank Murkowski and has served on the professional staff of the Senate Energy and Natural Resources Committee and the Senate Select Committee on Intelligence.
- **Mr. Mark R. Maddox** is the Acting Assistant Secretary for Fossil Energy (FE) at DOE. Prior to joining FE, Mr. Maddox served as senior policy advisor to the Secretary of Energy. Prior to coming to DOE in 2003, Mr. Maddox was director of communications and public affairs for a division of Lockheed Martin, Inc. that is now called Affiliated Computer Services State and Local Solutions, Inc.
- **Mr. William D. Magwood, IV** is the Director of the Office of Nuclear Energy, Science and Technology (NE) at DOE. Prior to joining DOE in 1994, Mr. Magwood held technology management positions with two energy-related organizations: Edison Electric Institute and Westinghouse Electric Corporation.
- **Mr. James W. Glotfelty** is the Director of the U.S. Department of Energy's Office of Electric Transmission and Distribution (OETD). Previously, Mr. Glotfelty served as a senior advisor to the Secretary of Energy, where he was a co-leader in the Department's contribution to the President's *National Energy Policy*. Mr. Glotfelty also served as an advisor on electricity to then-Governor Bush.

3. Overarching Questions

- How is the White House guidance to science and technology agencies reflected in the activities funded by the Department of Energy's (DOE) budget? In particular, does the DOE budget reflect the emphasis on long-term, high-risk activities that the Administration has stressed in its guidance to agencies?
- The Office of Management and Budget is applying new evaluation techniques to decide how well agency programs are working. Are programs being evaluated properly and do program budgets reflect the evaluations?
- In addition, there are a series of program-specific concerns that the Committee would like to explore. See the Questions to Witnesses in Section 5.

4. Background and Issues

(Background and issues are presented for DOE as a whole and then for each of the programs on which the hearing will focus.)

A) OVERALL DOE R&D

BACKGROUND:

The Five DOE Civilian R&D Offices: The $5.2 billion DOE R&D request is divided among the five offices represented at this hearing: The Office of Science (SC) funds basic research at universities and 10 national laboratories. The Office of Science contributes over 40 percent of the federal funds for civilian physical sciences research. The other four offices—Energy Efficiency and Renewable Energy (EERE), Fossil Energy (FE), Nuclear Energy Science and Technology (NE) and Electric Transmission and Distribution (TD)—run applied R&D programs.

U.S. Energy Context: The applied energy R&D request of $1.9 billion represents 3.25 percent of the civilian science and technology budget.[1] The research is designed to affect the energy sector of the economy, which constituted 7.2 percent of the gross domestic product (GDP) in 2002.[2] Energy may have an even larger influence on policy than its direct economic impact, due to its implications for foreign policy, and because virtually every other product or service in the economy requires some input of energy for its production and/or delivery.

DOE R&D in Budget Context: The President is proposing to spend $55.3 billion on all civilian research and development (R&D) in the fiscal year (FY) 2005 budget, or about 2.3 percent of the total proposed $2.4 trillion budget.[3] Of the amount proposed for total civilian R&D, 9.4 percent would go to DOE. Table 1 on the next page breaks down the proposed DOE R&D budget.

Table 1. Fiscal Year 2004 and Fiscal Year 2005 Funding for DOE Non-Defense R&D

Account	FY04 appropriation (in millions) *	FY05 Request (in millions)	Percentage Change from FY04 Level
Science	$3,500	$3,432	-2.0%
EERE R&D	$964	$919	-4.7%
Energy Conservation R&D	$607	$544	-10.4%
Renewable Energy Resources	$357	$375	5.0%
Fossil Energy			
FE R&D	$673	$636	-5.5%
Clean Coal Account**	-$98	-$140	-
Nuclear Energy R&D	$293	$300	2.4%
Electric Transm. & Dist.	$81	$91	12.3%
Total	**$5,413**	**$5,238**	**-3.3%**

* The figures in this chart are appropriated amounts for FY 04. The Administration sometimes excludes appropriations for earmarks from the FY 04 base, resulting in higher percentage changes from FY 04 to FY 05 than are shown here.

**The Clean Coal Technology Account has not received new budget authority since the early 1990s. Balances remaining in the fund from abandoned projects have been transferred in recent years to the Fossil Energy R&D account to fund similar demonstration activities. Summing these accounts distorts the programmatic effect of the transfers.

Source: President's Fiscal Year 2005 Budget Request: *Analytical Perspectives* page 61, and DOE FY 05 Congressional Budget Request.

ISSUES:

Does the proposed budget strike the appropriate balance between the physical sciences and the life sciences?: Life science research at the National

[1] Not including Department of Homeland Security funding.

[2] Numerator (energy expenditure) from the EIA's Annual Energy Review 2002 Table 3.4 on page 77. Denominator (GDP) from the year 2002 data in the President's 2005 Budget: *Historical Tables,* page 184.

[3] To calculate civilian R&D the Committee begin with the Federal Science and Technology (FS&T) budget (*Analytical Perspectives,* p. 61) and subtracted defense basic and applied research. These FS&T tables did not include any research in the Department of Homeland Security.

Institutes of Health (NIH) has more than doubled over the past decade, while research in the physical sciences has remained flat (see Figure 1). Is this the correct balance between life sciences and physical sciences? The largest percentage of federal non-defense physical sciences research funds come through DOE.

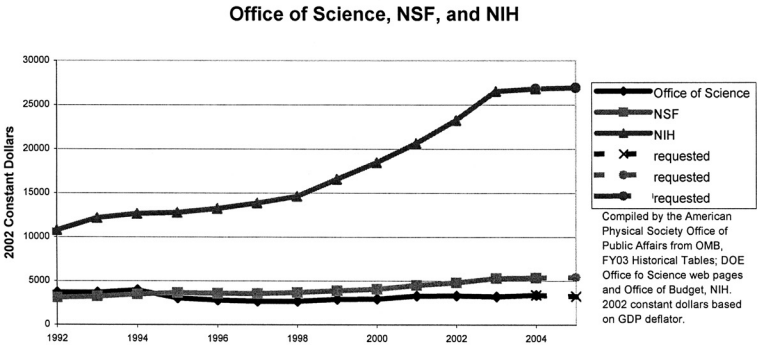


Figure 1: Past Decade of Funding History for DOE Office of Science, NSF and NIH.
Source: American Physical Society

Will a proposed change in budget scoring endanger funding for R&D? The proposed budget would change funding for the Yucca Mountain nuclear waste disposal facility from discretionary to mandatory spending. If Congress fails to approve this change—and Senate approval is unlikely given the controversy about Yucca Mountain—then $750 million will have to be cut from proposed discretionary spending in the Energy and Water appropriations to make up the difference.

Does the proposed budget over-emphasize demonstration projects at the expense of basic and applied research? In its FY05 guidance to federal science agencies, the White House indicated that federal R&D programs should emphasize high-risk, long-term research. Yet DOE's FY05 budget request appears to emphasize demonstration programs, which are inherently more expensive than research. For example, within the Office of Fossil Energy, funds are shifted from more fundamental research on coal to fund a large demonstration project.

How is the Program Assessment and Rating Tool (PART) affecting budget decisions? The Office of Management and Budget created the PART to better evaluate programs. But programs with poor evaluations do not always fare poorly in the budget proposal and programs that score well are not always well funded. (See the *PART* discussion in each of the sections below.)

Does the proposed budget reflect a reduced commitment to climate change technology? In the past, the Bush Administration has included in its budget request a specific funding amount for the Climate Change Technology Program, which was being led by DOE. The FY05 proposal does not break out the program. Meanwhile, the Committee is still awaiting receipt of a strategic plan for the existing Climate Change Technology Program, which was due last summer.

Does the proposed budget strike the appropriate balance among applied energy programs? The proposed budget reflects a continuing shift in emphasis away from energy efficiency R&D. Assuming the budget proposal is approved, since FY01, Fossil Energy R&D will have increased by 35 percent, and Renewable Energy R&D, including much of the Hydrogen fuel initiative, by 20 percent. Nuclear Energy, including shifts related to new laboratory costs, will have increased by 8.3 percent. Energy Efficiency R&D will have declined by 12 percent.

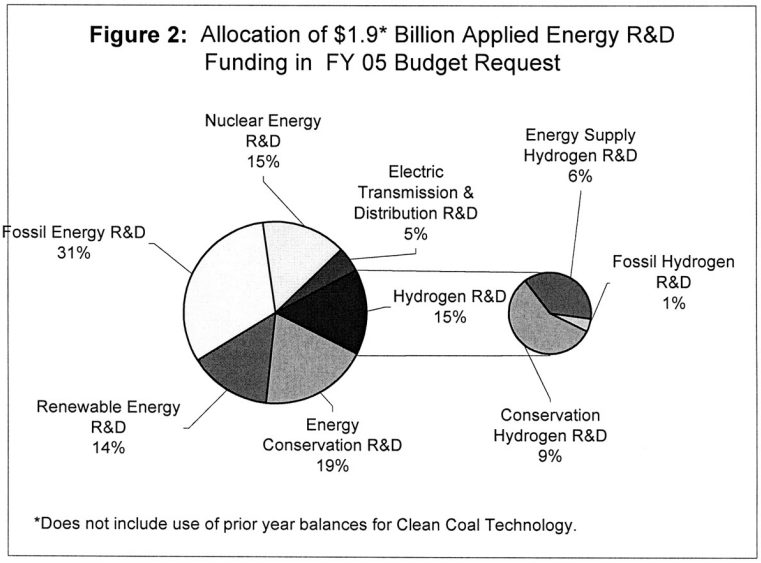


Figure 2: Allocation of $1.9* Billion Applied Energy R&D Funding in FY 05 Budget Request

B) OFFICE OF SCIENCE

BACKGROUND:

Budget Highlights: Science at DOE is cut by about $68 million compared to the FY04 enacted level, bringing the total down to about $3.4 billion. The Administration describes this as a two percent increase, if one excludes Congressional earmarks. In passing the Energy Bill, H.R. 6, the House authorized $4.2 billion for the Office for FY05.

The largest increase would go to Basic Energy Sciences, up $53 million (5.2 percent) including $29 million associated with the Hydrogen Initiative. The largest decrease would go to Biological and Environmental Research, where the Department shaved $140 million in earmarks.

PART: Office of Science programs have generally scored well recently on evaluations with the PART, receiving ratings of "moderately effective" and "effective." This has not led, however, to significant increases in funding.

Focus On Long-Term, High-Risk: As a source of funds for basic research, the activities in the Office of Science are inherently long-term and high-risk.

ISSUES:

Would the proposal to initiate several new projects make the Office of Science budget unsustainable over the long run? The FY05 budget request includes several new starts—for U.S. participation in the international fusion experiment known as ITER, for the Linac Coherent Light Source, and for a Protein Production and Tags Facility. To complete these projects, funding for them will have to increase significantly in the out years. Unless the Office of Science receives significant budget increases in future years—which does not seem likely—these projects will eat into the budgets for ongoing programs. DOE has not explained how it will deal with this.

Does the budget deal realistically with the need to update the infrastructure of the national laboratories? The budget proposes to cut the Science Laboratories Infrastructure line nearly in half (−46.4 percent). The justification for the cut is that DOE will start leasing facilities built by others rather than laying out construction funds. But this raises questions about whether such buildings will be

built for DOE needs rather than those of the contractor. Also, leasing arrangements save money up-front, but often cost more over the long run.

C) OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

BACKGROUND:

Budget Highlights: While the proposed budget would increase overall funding for EERE by 1.4 percent ($17.5 million), R&D funding would decline by 4.7 percent (−$45 million). That's because the largest increase in the account is for weatherization grants rather than R&D. The non-research programs, Weatherization and State Grants, are up $61 million or 23 percent. The Hydrogen R&D Initiatives, consisting of FreedomCAR and the Hydrogen Fuel Initiative, would also increase—by $27 million or 12 percent.

PART: EERE programs were among the earliest in the Federal Government to be subject to the R&D criteria. All but one of EERE's PART scores were "moderately effective," with Building Technologies receiving an "adequate" rating.

Focus On Long-Term, High-Risk: The Science Committee held a hearing on March 3, 2004 on two recent reports, which recommended that the hydrogen efforts at DOE turn more attention to fundamental science questions. One report called the milestones in a key program "unrealistically aggressive," and the other cautioned against premature demonstrations. For details, see the hearing charter and testimony: *http://www.house.gov/science/hearings/full04/index.htm.*

Table 2: Science Committee Analysis of Efficiency and Renewable Energy Research and Development funding Trends.

	FY03 appropriation (in millions)	FY04 appropriation (in millions) *	FY05 Request (in millions)	$ Change from FY04 Level	% Change from FY04 Level
Office of EE and RE	$1,202	$1,235	$1,251	$18	1.4%
Weatherization and state grants	$268	$271	$332	$61	23.0%
EERE R&D	$934	$964	$919	-$45	-4.7%
Hydrogen and FreedomCAR	$176	$237	$264	$27	12.0%
EERE R&D **other than** H2 and FreedomCAR	**$756**	**$727**	**$655**	**-$72**	**-9.9%**

* The figures in this chart include all appropriated amounts for FY 04. The Administration sometimes excludes appropriations for earmarks from the FY 04 base, resulting in higher percentage changes from FY 04 to FY 05 than are shown here. (See Appendix.)

ISSUES:

Does the proposed budget achieve the appropriate balance among EERE programs? EERE funds a range of alternative technologies, including biomass, wind, solar and geothermal. In recent years, an increasing percentage of EERE funds have gone to the President's Hydrogen Initiatives, including fuel and vehicle programs. This has limited funding for programs other than Hydrogen. In the FY05 proposal, funding for EERE R&D programs other than the Hydrogen Initiatives would decline by almost 10 percent. However, this figure counts Congressional earmarks in the FY04 base. If the earmarks are excluded, those programs still decline by about three percent. (See Appendix, Table 4.) Is this too great a loss in the base programs? Both the National Academy of Sciences and the American Physical Society in recent reports have noted that more R&D will be needed in alternative energy sources to help enable a hydrogen economy to reduce greenhouse gas emissions.

D) OFFICE OF FOSSIL ENERGY

BACKGROUND:

Budget Highlights: The President's budget and the DOE budget documents present significantly different figures for Fossil Energy. The Committee has asked DOE to

explain the disparities at this hearing. For example, the President's budget shows the President's Coal Research Initiative budget at $635 million in the table, compared to $287 million in the narrative description, and $447 million in DOE documents.

The increased funding for the Clean Coal Power Initiative in the Fossil Energy budget appears to come at the expense of the stationary fuel cell program (Distributed Generation) cut by $49 million (−68 percent), and other base coal programs. The budget does propose to rescind the funds for several Clean Coal projects that never got off the ground and to close the Clean Coal Technology account, moving most of the money to the base Fossil R&D program. This follows what the appropriators have been doing piecemeal for several years. Oil and gas programs are also cut by 57 percent (−$20 million) and 39 percent (−$17 million), but these two programs were among the few rated "ineffective" by the PART.

PART: FE PART scores vary from "adequate" for the coal programs to "ineffective" for the oil and gas programs. The oil and gas programs are among only a handful (only 0.1 percent of R&D) of all government programs rated as "ineffective" by the PART.

Focus On Long-Term, High-Risk: The FY05 budget emphasizes FutureGen, a large project to demonstrate carbon dioxide sequestration at a coal-fired power plant. While sequestration is a largely untested technology, demonstration projects usually are undertaken after risks are reduced. The emphasis on FutureGen raises the question of whether the project is a departure from the intention to focus R&D programs on "long-term, high risk" projects or whether FutureGen may be premature as a full-scale demonstration of sequestration before the risks are fully understood and addressed. (See more below.)

ISSUES:

Does the proposed budget emphasize demonstration projects at the expense of core research? The budget request proposes to fund about half of the government share of the FutureGen project—$237 million—of which just $18 million will be expended in FY05. The FutureGen demonstration project would build a new coal gasification power plant to experiment with the sequestration of carbon dioxide and the production of hydrogen. The Administration is also proposing a change from current law that, among other things, currently protect the government from cost overruns in clean coal projects.

E) OFFICE OF NUCLEAR ENERGY, SCIENCE AND TECHNOLOGY

BACKGROUND:

Budget Highlights: The budget proposes to increase funding for the Office of Nuclear Energy, Science and Technology (NE) by 2.2 percent, from $293 million to $300 million. However, the nuclear energy R&D budget lines would decline from $130 million to $96 million, with six programs being merged into four. The Advanced Fuel Cycle Initiative, a centerpiece of last year's budget, is cut from $67 million to $46 million.

PART: The NE ratings were mixed. The Advanced Fuel Cycle Initiative (AFCI) and the Generation IV Nuclear Energy Systems Initiatives each received a rating of "moderately effective," while the Nuclear Power 2010 (Nuclear Energy Technologies) program received a rating of "adequate." The Nuclear Energy Research Initiative (NERI) was determined to have "results not demonstrated."

Focus On Long-Term, High-Risk: The budget would reduce funding for one long-term program, the Advanced Fuel Cycle Initiative (AFCI), and merge another, the Nuclear Energy Research Initiative (NERI), into other programs. The AFCI develops technologies that can reduce the volume and long-term toxicity of high-level waste. NERI, which funds peer-reviewed nuclear research at universities, will reportedly be incorporated into existing programs. It is unclear, however, whether the merged effort would continue NERI's focus on fundamental research questions.

ISSUES:

Will the Office of Nuclear Energy's new responsibilities as the "landlord" of the Idaho National Laboratory reduce funding for other programs? DOE decided in 2003 to change the way it managed what was then the Idaho National Engineering and Environmental Laboratory and the Argonne-West Laboratory, which was co-located with it. DOE merged the R&D programs of the two labs to create the new Idaho National Laboratory (INL). DOE made NE the "landlord" for INL, meaning the Office will have the responsibility of covering infrastructure and

personnel costs related to the laboratory. Previously, those matters were the responsibility of DOE's Environmental Management program. The upshot of this change is that NE will have to cover $33 million in costs formerly borne by Environmental Management. NE needed funds to cover these new costs, and partly as a result, NE's nuclear R&D budget lines would get a $34 million, 26 percent cut in the FY05 budget. DOE argues that at least some of the new costs related to INL will not recur because they will be used to make one-time payments to employees who were affected by the merger of the two laboratories.

F) OFFICE OF ELECTRIC TRANSMISSION AND DISTRIBUTION

BACKGROUND:

Budget Highlights: This Office, created in FY04, would receive a $10 million increase under the proposed budget—half to R&D programs and half to program direction for personnel increases. The largest area of funding for the Office is the High Temperature Superconductivity (HTS) R&D program, which also would receive the largest increase, at +$11 million (32 percent). Also seeing increases are two new initiatives, GridWise and GridWorks. These programs are focused on developing communications and control technologies along with advanced cables, switches, and monitors to improve the transmission and distribution of electricity. Distribution R&D would be reduced, down $9 million (−63 percent).

PART: HTS R&D was the only Office program evaluated; OMB rated it "moderately effective."

Focus On Long-Term, High-Risk: In response to the blackout of August 14, 2003, this Office has dedicated additional effort to short-term congestion relief technologies.

ISSUES:

Will cuts to energy storage R&D have an adverse effect on other DOE programs? The request for Energy Storage, received a large cut of $5 million (−56 percent). Will this reduction cause a delay in commercialization of technologies being funded in other parts of DOE? The storage of energy is vital to emerging technologies such as wind, fuel cells, and solar-generated electricity. Such sources can only generate power intermittently (when the wind is blowing, for example), and they would be much more attractive if the energy they generate could be stored for later use. Before the Office was created, storage programs resided in EERE.

5. Witnesses Questions

Witnesses have been asked to summarize the budget request for their offices focusing on activities identified as part of the Federal Science and Technology (FS&T) budget and specifically address the following issues:

Questions for Dr. Decker

- The recently released Strategic Plan and the 20-Year Facilities Plan assume that the Office of Science will receive funding at levels in H.R. 6. Given that the fiscal year 2004 appropriation did not match that level, and the President's request does not match the proposed authorization level for fiscal year 2005, how does the Office of Science plan to cope with these lower budget numbers?
- It is our understanding that negotiations are continuing on the location for the international fusion experiment. Please provide an update of on negotiations for the International Thermonuclear Experimental Reactor (ITER), and what the budget implications are likely to be if ITER negotiations collapse.
- The President's Management Agenda (PMA) includes government-wide provisions on budget and performance integration that have been implemented through the Program Assessment and Rating Tool (PART) In addition, the PMA also introduced R&D Investment Criteria that were piloted in DOE's applied R&D programs. Please provide examples of how you prepared data under these requirements, how those data were used for budget and management decisions, and how these activities dovetail with the Government Performance and Results Act of 1993.
- Using the definitions in OMB Circular A–11, what is the proposed mix of funding in the fiscal year 2005 budget request between basic research, applied research, development, demonstration, and deployment activities for your office? Please provide the comparable fiscal year 2004 numbers.

Questions for Mr. Garman

- Please provide the fiscal year 2004 enacted level and the President's fiscal year 2005 request for the following programs individually:
  - — Industrial Technologies Program
  - — Biomass Program
  - — Distributed Energy Program
  - — Building Technologies Program
  - — Solar Energy Technologies Program
  - — Hydrogen, Fuel Cells and Infrastructure Technologies Program
  - — Wind and Hydropower Technologies Program
  - — Geothermal Technologies Program
  - — Weatherization and Intergovernmental Program
  - — Federal Energy Management Program
  - — FreedomCAR and Vehicle Technologies Program
- This year's budget makes almost no mention of the Climate Change Technology Initiative. What has happened to this program, and why has the Administration decided to de-emphasize it?
- The President's Management Agenda (PMA) includes government-wide provisions on budget and performance integration, that has been implemented through the Program Assessment and Rating Tool (PART) In addition, the PMA also introduced R&D Investment Criteria that were piloted in DOE's applied R&D programs. Please provide examples of how you prepared data under these requirements, how those data were used for budget and management decisions, and how these activities dovetail with the Government Performance and Results Act of 1993.
- Using the definitions in OMB Circular A–11, what is the proposed mix of funding in the fiscal year 2005 budget request between basic research, applied research, development, demonstration, and deployment activities for your office? Please provide the comparable fiscal year 2004 numbers.

Questions for Mr. Maddox

- Please clarify how the program authorization level totaling $888 million in the President's budget request for fiscal year 2005 squares with a request for new budget authority of only $636 million (p. 395 of the Appendix to Budget of the U.S. Government.) In addition, in the President's budget, the President's Coal Research Initiative shows a new obligation level of $635 million, whereas the DOE fiscal year 2005 Budget Request shows the Initiative at the $447 million level. Finally, the President's budget request shows a planned unobligated balance of $602 million for the end of this fiscal year. What is the Department planning to spend on coal activities in fiscal year 2005 and how do unobligated balances factor into the spending plan?
- Given the importance of fuel cells to the hydrogen economy, please address why the department chose to reduce funding for distributed generation systems, including stationary fuel cells, by two thirds ($48 million).
- The President's Management Agenda (PMA) includes government-wide provisions on budget and performance integration that have been implemented through the Program Assessment and Rating Tool (PART). In addition, the PMA also introduced R&D Investment Criteria that were piloted in DOE's applied R&D programs. Please provide examples of how you prepared data under these requirements, how those data were used for budget and management decisions, and how these activities dovetail with the Government Performance and Results Act of 1993.
- Using the definitions in OMB Circular A–11, what is the proposed mix of funding in the fiscal year 2005 budget request between basic research, applied research, development, demonstration, and deployment activities for your office? Please provide the comparable fiscal year 2004 numbers.

Questions for Mr. Magwood

- The Department recently decided to split the Idaho National Engineering and Environmental Laboratory (INEEL) management contract into a clean-up portion (on-site nuclear waste clean-up project) and a research portion (a newly-redesignated laboratory for nuclear energy research Idaho National

Laboratory (INL)). Please outline the Department's statutory authority to make this change and the Congressional consultation process that preceded it.

- Please detail Nuclear Energy Science and Technology program costs in fiscal year 2005 and out-years resulting from the transitioning of INEEL and ANL–West to INL. When the decision was made to split the contract at INEEL, did the department realize that some workers would not fit in the new structure? If so, please explain why the Department is responsible for paying transition costs to these workers and why those costs should come at the expense of nuclear energy R&D.
- The Department has proposed reclassification of $750 million in funding for Yucca Mountain as offsetting collections, a change that requires statutory authorization. Please describe the consequences to the budget if this change is not enacted. In addition, please describe how any consequent delays in the construction of the Yucca Mountain waste disposal facility would impact plans and priorities in the nuclear energy R&D program.
- The President's Management Agenda (PMA) includes government-wide provisions on budget and performance integration that have been implemented through the Program Assessment and Rating Tool (PART). In addition, the PMA also introduced R&D Investment Criteria that were piloted in DOE's applied R&D programs. Please provide examples of how you prepared data under these requirements, how those data were used for budget and management decisions, and how these activities dovetail with the Government Performance and Results Act of 1993.
- Using the definitions in OMB Circular A-11, what is the proposed mix of funding in the fiscal year 2005 budget request between basic research, applied research, development, demonstration, and deployment activities for your office? Please provide the comparable fiscal year 2004 numbers.

Questions for Mr. Glotfelty

- Please discuss the needs that led to the establishment of GridWise and GridWorks.
- This year's budget shows a reduction in energy storage, down to $4 million from $9 million in fiscal years 2002, 2003, and 2004. Are there reasons for this decrease, other than significant earmarking in the account? Has the Department determined that there is a decreased potential for energy storage technologies to contribute to grid stability? How does this reduction interact with the likely contribution of intermittent sources (such as wind—the fastest growing power source on a percentage basis) that are being connected to the grid in response to state renewable portfolio standards?
- The President's Management Agenda (PMA) includes government-wide provisions on budget and performance integration that have been implemented through the Program Assessment and Rating Tool (PART). In addition, the PMA also introduced R&D Investment Criteria that were piloted in DOE's applied R&D programs. Please provide examples of how you prepared data under these requirements, how those data were used for budget and management decisions, and how these activities dovetail with the Government Performance and Results Act of 1993.
- Using the definitions in OMB Circular A–11, what is the proposed mix of funding in the fiscal year 2005 budget request between basic research, applied research, development, demonstration, and deployment activities for your office? Please provide the comparable fiscal year 2004 numbers for comparison.

Appendix: Additional Budget Details

Table 3. DOE Civilian R&D Budget History and Details: Winner and Losers. *Pink denotes budget cuts, green, increases > 3%.*

	FY01 Actual	FY03 Actual	FY04 Enacted	FY05 Request	Amount Change		Percent Change	
					from FY01	from FY04	from FY01	from FY04
Science	3309	3322	3500	3432	122	-68	3.7%	-2.0%
HEP	697	702	734	737	40	4	5.7%	0.5%
NP	351	371	390	401	50	11	14.4%	2.9%
BER	554	494	641	502	-53	-140	-9.5%	-21.8%
BES	980	1002	1011	1064	84	53	8.6%	5.2%
ASCR	150	163	202	204	54	2	36.0%	1.0%
FES	241	241	263	264	23	2	9.5%	0.6%
O(1)	336	349	260	260	-77	0	-22.8%	-0.1%
FE								
FERD	471	611	673	636	165	-37	35.1%	-5.5%
CCT	-107	-47	-98	-140				
EERE	931	934	964	919	-12	-46	-1.3%	-4.7%
RE	312	322	357	375	63	17	20.1%	4.8%
EE (2)	619	612	607	544	-75	-63	-12.1%	-10.4%
NE (3)	238	258	293	300	23	7	8.3%	2.4%
ETD	56	88	81	91	35	10	62.3%	12.5%
Total (4)	**4,898**	**5,167**	**5,413**	**5,237**	**207**	**-97**	**6.9%**	**-3.3%**

Source: Department of Energy FY2005 Congressional Budget Request unless otherwise noted
(1) Includes Safeguards and Security (less reimbursable work), Workforce Development for Scientists and Teachers and small business set-asides.
(2) Weatherization (and other grants) subtracted--using FS&T numbers from Budget of the U.S. Government: Analytical Perspectives
(3) Does not include non-civilian nuclear activities
(4) Reflects adjustments made in PL 108-199 as reflected in H Rept. 108-401

Key to Abbreviations

SC	Science
HEP	High Energy Physics
NP	Nuclear Physics
BER	Biological and Environmental Research
BES	Basic Energy Sciences
ASCR	Advanced Scientific Computing Research
FES	Fusion Energy Science
O	Other Science Programs
FE	Office of Fossil Energy
FERD	Fossil Energy Research and Development Account
CCT	Clean Coal Technology Account
EERE	Office of Fossil Energy
RE	Renewable Energy (in Energy Supply account)
EE	Energy Efficiency in Energy Conservation account
NE	Nuclear Energy Science and Technology (in Energy Supply account)
ETD	Electric Transmission and Distribution

Table 4: Programmatic Effect Of Earmarks in EERE

EERE budget simplified
By Program
Reductions in Pink. Hydrogen program in yellow

	FY03 Actual	FY04 Actual	FY04 Earmarks **	FY05 Request	$ change FY04 Actual - 05 Request	% change FY04 Actual - 05 Request	$ change FY04 Actual w/o earmarks to 05	% change FY04 Actual w/o earmarks to 05
Biomass	109,333	93,977	41,467	81,276	-12,701	-13.52%	28,766	54.78%
Building Technologies	65,899	59,866	265	58,284	-1,582	-2.64%	-1,317	-2.21%
Distributed Energy	60,054	61,023	1,000	53,080	-7,943	-13.02%	-6,943	-11.57%
Federal Energy Management Program	20,744	21,679		19,867	-1,812	-8.36%	-1,812	-8.36%
Geothermal technologies	28,390	25,508	1,961	25,800	292	1.14%	2,253	9.57%
Hydrogen and Fuel Cell Technologies	92,019	147,178	39,701	172,825	25,647	17.43%	65,348	60.80%
Industrial Technology	96,824	93,068		58,102	-34,966	-37.57%	-34,966	-37.57%
Solar Energy Technology	82,330	83,393	3,642	80,333	-3,060	-3.67%	582	0.73%
Vehicle Technologies*	174,171	178,002		156,656	-21,346	-11.99%	-21,346	-11.99%
Weatherization and Intergovernmental	328,604	323,332	6,050	380,067	56,735	17.55%	62,785	19.79%
Wind and Hydropower	46,656	46,215	1	47,600	1,385	3.00%	1,386	3.00%
All other	7,737	17,869	9,000	14,480	-3,389	-18.97%	5,611	63.27%
Program Direction (Supply)	12,615	12,364		20,711	8,347	67.51%	8,347	67.51%
Program Direction (Conservation)	76,950	85,004	3,500	81,664	-3,340	-3.93%	160	0.20%
Renewable energy subtotal (Supply)	322,150	370,494	105,803	374,812	4,318	1.17%	110,121	41.60%
Energy Efficiency subtotal (Conservation)	880,176	877,984	4,765	875,933	-2,051	-0.23%	2,714	0.31%
EERE Subtotal	**1,202,326**	**1,248,478**	**106,588**	**1,250,745**	**4,534**	**0.36%**	**108,855**	**9.53%**
Use of Prior Year Balances	0	-13,000		0	13,000	100.00%		
Grand Total	**1,202,326**	**1,235,478**	**106,588**	**1,250,745**	**22,068**	**1.79%**	**121,855**	**10.79%**

* Includes some hydrogen funding, but hydrogen portions were not cut.

**General reduction not applied.

Chairman BIGGERT. The hearing on the Energy Subcommittee of the Science Committee will come to order.

Before we begin, I want to welcome Representative Larson as the new Ranking Member of the Energy Subcommittee. I am happy to have you here. Thank you.

And I also want to welcome everyone to the hearing of the Energy Subcommittee on the Department of Energy's proposed investments in research and development for fiscal year 2005. Operating in the most constrained budget environment in many years, Congress has a duty to choose among competing priorities, and this year, the choices are especially difficult. Today, we will learn more about how the DOE plans to spend its limited resources. While 7.2 percent of the Nation's GDP is spent on energy, a number that doesn't account for the indirect costs of securing those energy supplies, only 3.25 percent of the federal civilian R&D budget is spent on energy technology.

As we face high oil prices not seen since before the first Gulf War, we must be clear about our priorities. Our energy challenges are just too great for us to do otherwise. That is why we will hear testimony today from witnesses from five DOE offices with responsibility for research and development across the board, including science, energy efficiency, and renewable energy, fossil energy, nuclear energy, and electric transmission and distribution.

Turning to the Office of Science, I will admit that I was disappointed when I saw the President's budget request of $3.4 billion for fiscal year 2005. We know the long-term economic benefits from physical science research, and yet federal funding for research in the physical sciences has been flat for more than a decade. It remains flat in the proposed budget for fiscal year 2005 despite the fact that comprehensive energy bills passed by both the House and the Senate include an authorization level of about $4 billion for the Office of Science in fiscal year 2005. This represents nearly a 20 percent increase for the Office of Science over current levels—funding levels.

I think Congress has been clear that it supports increased funding for the Office of Science to make up for years of inadequate budgets. In fiscal year 2004, Congress provided a one percent increase over the President's request. The two percent cut proposed for fiscal year 2005 seems to ignore that Congressional support and the justification for it. That justification was clearly delineated last fall, and the Office of Science released its 20-year facilities plan, which describes the world class scientific facilities we could build in this country if we invest at levels included in H.R. 6, the Comprehensive Energy package. This plan was the result of lengthy deliberations across scientific disciplines and some plain old tough choices.

Ray Orbach, the Director of the Office of Science, has performed a tremendous service to our nation's scientific research enterprise by leading the effort to develop a ranked list of priority facilities. The plan not only outlines the benefit of future research, but is a testament to the disciplined management approach that can serve as a model for other agencies. How the fiscal year 2005 budget will impact that plan is one of the issues we will address today.

As for the Office of Nuclear Energy, Science and Technology, I am very concerned about the heavy cuts proposed to nuclear energy R&D. The Nuclear Energy Research Initiative is eliminated. The Advanced Fuel Cell Initiative is cut by ⅓. Even the Nuclear Power 2010 program is cut in half.

Meanwhile, in the midst of the tightest budget conditions in decades, the DOE now has decided to create a brand new national laboratory called the Idaho National Laboratory. The irony is that at the very time that Congress is struggling to find dollars for nuclear R&D, DOE is taking those scarce dollars and using them to pay for infrastructure costs associated with the new laboratory. While I support the Department's designation of a lead laboratory, I have serious concerns about how the Department is going about creating this lab. I am particularly concerned about the impact of those recent actions on existing nuclear R&D programs and facilities, including those in Idaho, that have served the Nation well for decades.

That is what I want to explore today. Some of the broader issues will be covered more in depth at a later hearing.

Unfortunately, I have exhausted my time before being able to express a concern I know many of my colleagues share. It has to do with the shrinking energy efficiency R&D budget and its impact on programs designed to help industry operate more efficiently and, as a consequence, keep jobs in the U.S.

On that note, I will conclude by saying I am looking forward to the hearing, the testimony of the witnesses here today, and to working with them and others to do the best what—the best we can to support science and energy-related R&D. We are talking today about programs that matter a great deal to our nation's economic and energy future. During these tight fiscal times, we must set priorities and use scarce resources wisely. We are here today to make sure the proposed fiscal year 2005 budget meets these standards.

And I will now recognize the Ranking Member from Connecticut, Mr. Larson.

[The prepared statement of Mrs. Biggert follows:]

PREPARED STATEMENT OF CHAIRMAN JUDY BIGGERT

The hearing will come to order. I want to welcome everyone to this hearing of the Energy Subcommittee on the Department of Energy's (DOE) proposed investments in research and development for fiscal year 2005. Operating in the most constrained budget environment in many years, Congress has a duty to choose among competing priorities. And this year, the choices are especially.

Today, we will learn more about how the DOE plans to spend its limited resources. While 7.2 percent of the Nation's GDP is spent on energy—a number that doesn't account for the indirect costs of securing those energy supplies—only 3.25 percent of the federal civilian R&D budget is spent on energy technology. As we face high oil prices not seen since before the first Gulf War, we must be clear about our priorities; our energy challenges are just too great for us to do otherwise.

That's why we will hear testimony today from witnesses from five DOE offices with responsibility for research and development across the board, including science, energy efficiency and renewable energy, fossil energy, nuclear energy, and electric transmission and distribution.

Turning to the Office of Science, I'll admit that I was disappointed when I saw the President's budget request of $3.4 billion for FY05. We know the long-term economic benefits from physical sciences research, and yet federal funding for research in the physical sciences has been flat for more than a decade.

It remains flat in the proposed budget for FY05, despite the fact that comprehensive energy bills passed by both the House and Senate included an authorization level of about $4 billion for the Office of Science in FY05. This represents nearly a 20 percent increase for the Office of Science over current funding levels. I think Congress has been clear that it supports increased funding for the Office of Science to make up for years of inadequate budgets. In FY04, Congress provided a one percent increase over the President's request. The two percent cut proposed for FY05 seems to ignore that Congressional support, and the justification for it.

That justification was clearly delineated last fall when the Office of Science released its twenty-year facilities plan, which describes the world-class scientific facilities we can build in this country if we invest at the levels included in H.R. 6, the comprehensive energy package. This plan was the result of lengthy deliberations across scientific disciplines, and some plain old tough choices. Ray Orbach, the Director of the Office of Science, has performed a tremendous service to our nation's scientific research enterprise by leading the effort to develop a ranked list of priority facilities. The plan not only outlines the benefits of future research, but is a testament to the disciplined management approach that can serve as a model for other agencies. How the FY05 budget will impact that plan is one of the issues we will address today.

As for the Office of Nuclear Energy, Science, and Technology, I am very concerned about the heavy cuts proposed to nuclear energy R&D. The Nuclear Energy Research Initiative is eliminated. The Advanced Fuel Cycle Initiative is cut by one-third. Even the Nuclear Power 2010 program is cut in half.

Meanwhile, in the midst of the tightest budget conditions in decades, the DOE now has decided to create a brand new national laboratory called the Idaho National Laboratory. The irony is that at the very time that Congress is struggling to find dollars for nuclear R&D, DOE is taking those scarce dollars and using them to pay for infrastructure costs associated with a new laboratory.

While I support the Department's designation of a lead laboratory, I have serious concerns about how the Department is going about creating this laboratory. I am particularly concerned about the impact of these recent actions on existing nuclear R&D programs and facilities, including those in Idaho, that have served the Nation well for decades. That's what I want to explore today. Some of the broader issues will be covered in more depth at a later hearing.

Unfortunately, I've exhausted my time before being able to express a concern I know many of my colleagues share. It has to do with the shrinking energy efficiency R&D budget, and its impact on programs designed to help industry operate more efficiently and, as a consequence, keep jobs in the U.S.

On that note, I will conclude by saying that I'm looking forward to hearing the testimony of the witnesses here today, and to working with them and others to do the best we can to support science and energy related R&D. We are talking today about programs that matter a great deal to our nation's economic and energy future. During these tight fiscal times, we must set priorities and use scarce resources wisely. We are here today to make sure the proposed FY05 budget meets these standards.

Thank you very much.

Mr. LARSON. Thank you, Madame Chairman, and let me clear my throat.

Chairman BIGGERT. I have a cold.

Mr. LARSON. It must be catching.

Thank you, Madame Chairman, and let me, first and foremost, associate myself with the remarks that you have made and thank you for recognizing me at this time. I assure you I will be brief. I have a written statement that I will submit for the record, and I hope I can revise and extend my remarks as we go forward.

To be brief, and blunt, I share your concern and disappointment with regard to the President's budget proposal and the continued flattening of the science budget. And it is deep concern to many of us on this committee. And I, for one, want to take the time to focus on an overarching concern that we have as it relates to jobs in this country and the role of the scientific community in job creation, especially, not only in our labs, but also the concern that we have with regard to manufacturing and the brain drain that has taken

place in my state and across this country. In Connecticut alone, we have lost more than 40,000 manufacturing jobs and the brain drain and the lack of people going into science and engineering and the continuing exporting of jobs and outsourcing of jobs and technology remains a concern that is utmost on my mind and the minds of many Members of Congress.

I believe our government has yet to fully understand the forces that are rewriting the rules of international competition. The Internet is opening up avenues of competition that were almost unheard of just a few months ago. Many scientists and engineers that are trained in this country are now able to return to their countries and compete with our citizens in this country by means of the broadband and use of Internet connections. And more can be expected to avail themselves of these opportunities in the months and years ahead.

Science and technology has made that possible. Now we need to apply the enormous skills and abilities that we have in DOE and the national laboratories conducting research that creates jobs and develops technologies that will create new jobs in the future, hopefully jobs that will stay in the United States.

I look forward to your testimony here today, and my line of questioning will focus on those specific areas. I hope that the one message that you take away from this hearing today is DOE is part of the job and employment solution. The Department is a major source of jobs, particularly our national laboratories. The laboratories are a terrific engine in communities and regions where they are located, but DOE can do much more. Increasing funding in applied research and ramping up new programs at colleges, universities, and businesses that have the desire to participate can have a significant economic effect in Districts, such as mine, and across this great nation.

So I thank you, Madame Chairman, and I thank the panelists. I look forward to your testimony.

[The prepared statement of Mr. Larson follows:]

PREPARED STATEMENT OF REPRESENTATIVE JOHN B. LARSON

Madame Chairman, thank you for recognizing me at this time and I will be brief.

To be blunt and brief, I am disappointed in the President's request for the funding of the DOE science programs. At a time when this country faces economic challenges from many quarters, the administration continues to hold the Office of Science essentially flat.

I worry about the jobs that are leaving this country literally by the planeload. In my part of Connecticut, job losses have been immense and represent a major challenge for the leadership of our communities and state. We are trying to attract business and industry into the Connecticut River Valley but we have the feeling that we are getting precious little help from the federal government.

Our government has yet to fully understand the forces that are rewriting the rules of international competition. The Internet is opening up avenues for competition that were almost unheard of just a few months ago. Many scientists and engineers that trained in this country are now able to return to their countries and compete with our citizens in this country by means of these marvelous broadband connections. And more can be expected to avail themselves of these opportunities in the months and years ahead.

Science and technology has made that possible. Now we need to apply the enormous skills and abilities that we have in the DOE and the National Laboratories to conducting research that creates jobs now and develops the technologies that will create new jobs in the future—hopefully jobs that will stay in the United States.

I don't have a lab. I won't get a lab. But my district and scores of others like mine can benefit from increased funding in applied research and providing research opportunities in cities and towns were the capabilities exist.

I hope that one of the messages that you take away from this hearing today is the DOE is part of the job and employment solution. The department is a major source of jobs—particularly the national laboratories—and the laboratories are a terrific economic engine in the communities and regions where they are located. But DOE can do much more. Increasing funding in applied research and ramping up new programs at colleges, universities, and businesses that have the desire to participate can have a significant economic effect in districts such as mine.

Thank you Madame Chairman.

Chairman BIGGERT. Thank you, Mr. Larson.

All of our witnesses today are from the Department of Energy, and I thank all of you for being with us this morning. Our witnesses are, to my left, Dr. James Decker, the Principal Deputy Director of the Office of Science, Mr. David Garman, the Assistant Secretary for Energy Efficiency and Renewable Energy, Mr. Mark R. Maddox, the Acting Assistant Secretary for Fossil Energy, Mr. William D. Magwood, the Director of the Office of Nuclear Energy, Science and Technology, and finally, Mr. James Glotfelty, the Director of the U.S. Department of Energy's Office of Electric Transmission and Distribution.

And I know that all of the witnesses know, because you have been here before us often, spoken testimony will be limited to five minutes each, after which the Members will have five minutes each to ask questions. So we will begin with Mr. Decker.

STATEMENT OF DR. JAMES F. DECKER, PRINCIPAL DEPUTY DIRECTOR OF THE OFFICE OF SCIENCE, U.S. DEPARTMENT OF ENERGY

Dr. DECKER. Madame Chairman and Members of the Subcommittee, I am pleased to be here today to discuss the President's fiscal year 2005 budget request for the Office of Science. First, however, I would like to thank you and the Members of this subcommittee for your support over the years. Your support has been essential to ensuring that our nation stays at the leading edge of science and technology for energy and security.

The Office of Science funds basic research in support of the Department of Energy's missions of national energy and economic security, environmental restoration, and science. We manage 10 of America's national laboratories, and we also built and operate the world's finest suite of scientific facilities and instruments that researchers depend upon to extend the frontiers of science.

The Office of Science's research investments have yielded a wealth of dividends, including significant technological innovations, medical and health advances, new intellectual capital, enhanced economic competitiveness, and improved quality of life for the American people. The Office of Science's 2005 budget request is $3 billion 431 million, which will allow the Office to carry forward with the Department's and the Administration's priorities in critical areas of science. It will allow us to continue a broad program of research at national laboratories and universities nationwide in advanced scientific computing, basic energy sciences, biological and environmental research, fusion energy sciences, high-energy physics, and nuclear physics.

Our budget request will keep our nation on the path to harness the promise of fusion energy with important investments in ITER and other fusion activities. The President's budget request enables us to operate our scientific user facilities, which are located primarily at national laboratories around the country, and used by more than 19,000 researchers each year. Utilization of these facilities would increase to 95 percent of optimum use from 92 percent in fiscal year 2004.

Our budget request provides funding to continue construction of the Spallation Neutron Source, and I am pleased to report that that $1.4 billion facility is on cost and schedule. The request supports project engineering design and construction of four nanoscience research centers and a major item of equipment for the fifth and final nanoscience research center located at the Argonne National Laboratory. The President's request also provides funding for the development of future opportunities. It will enable investments in leadership class machines for high-end computation essential for America's open scientific and technological research and economic development.

This year, we are also requesting $29 million as part of the President's Hydrogen Initiative to substantially reduce the cost of producing, storing, and using hydrogen. This budget enables us to begin our planning for the future of science in America through important progress on the priorities set out in the Facilities for the Future of Science and in the Office of Science Strategic Plan. It also includes funding for long-lead procurement for the Linac Coherent Light Source, a revolutionary x-ray free-electron laser light source. With these tools, we will be able to understand how the composition of materials affects their properties, watch proteins fold, see chemical reactions, and design matter for desired outcomes.

Finally, this request provides the funding needed to initiate project engineering design activities for the GTL Facility for the Production and Characterization of Proteins and Molecular Tags. This facility promises to accelerate the rate and cost-effectiveness with which genomics research experiments can be done. The Department, through the Genomics: GTL program, will attempt to use genetic techniques to harness microbes to produce hydrogen, to absorb carbon dioxide, and aid environmental remediation.

Madame Chairman, the full details of our budget request are provided in the written statement that I have submitted. I respectfully request that this statement be included in the record, and I would be delighted to answer any questions that you and the Committee may have

[The prepared statement of Dr. Decker follows:]

PREPARED STATEMENT OF JAMES F. DECKER

Madam Chairman and Members of the Subcommittee, thank you for the opportunity to testify today about the Department of Energy's (DOE) Office of Science (SC) Fiscal Year 2005 budget request. The Department appreciates the support of the Chairman and the Members of the Committee over the past years and I look forward to working with you to ensure that our nation stays at the leading edge of science and technology.

The Office of Science FY 2005 budget request is $3.4 billion, a $68.5 million decrease from the FY 2004 appropriation levels. When $140.8 million for FY 2004 Congressionally-directed projects is set aside, there is an increase of $72.3 million

in FY 2005. This request makes investments in: Advanced Scientific Computing Research (ASCR), Basic Energy Sciences (BES), Biological and Environmental Research (BER), Fusion Energy Sciences (FES), High Energy Physics (HEP), Nuclear Physics (NP), Science Laboratories Infrastructure, Safeguards and Security, Workforce Development for Teachers and Scientists and Science Program Direction.

Using the definitions in OMB Circular A–11, 76 percent of the Office of Science FY 2005 budget request is for basic research, and zero percent is for applied research, development, demonstration and deployment activities. Of the remainder, 16 percent is for Capital Equipment and Construction; and eight percent is for Science Laboratories Infrastructure, Science Program Direction, Workforce Development for Teachers and Scientists, and Safeguards and Security.

This budget allows us to increase support for high priority scientific research, increase operations at our key scientific user facilities, keep major science construction projects on schedule, and support new initiatives. This request, coming at a time of tight overall federal budgets, is also a demonstration of the Administration's support for basic research and the role that fundamental science plays in keeping our nation strong and secure.

Office of Science
FY 2005 President's Request
(B/A in thousands)

	FY 2003 Comparable Approp.	FY 2004 Comparable Approp.	FY 2005 President's Request
Science			
Advanced Scientific Computing Research	163,185	202,292	204,340
Basic Energy Sciences	1,001,941	1,010,591	1,063,530
Biological & Environmental Research	494,360	641,454	501,590
Congressionally-directed projects	*(51,927)*	*(140,762)*	*(——)*
Core Biological and Environmental Research	*(442,433)*	*(500,692)*	*(501,590)*
Fusion Energy Sciences	240,695	262,555	264,110
High Energy Physics	702,038	733,631	737,380
Nuclear Physics	370,655	389,623	401,040
Science Laboratories Infrastructure	45,109	54,280	29,090
Science Program Direction	137,425	152,581	155,268
Workforce Development for Teachers & Scientists	5,392	6,432	7,660
Small Business Innovation Research/Technology Transfer	100,172	——	——
Safeguards and Security	61,272	56,730	67,710
Subtotal, Science	3,322,244	3,510,169	3,431,718
Use of prior year balances	——	-10,000	——
Total, Science	**3,322,244**	**3,500,169**	**3,431,718**
Total, excluding Congressionally-directed projects	*(3,270,317)*	*(3,359,407)*	*(3,431,718)*

I am proud to tell you that the Department of Energy was ranked the most improved cabinet-level agency in the most recent scorecard to assess implementation of the President's Management Agenda (PMA). The scorecard, which evaluates agency performance in the areas of human capital, competitive sourcing, financial management, e-government, and budget/performance integration, was issued by the Office of Management and Budget (OMB) in January and recognized the Department as one of the agencies "leading the pack with regard to management improvement."

Budget and performance integration is implemented using the Program Assessment and Rating Tool (PART). PART includes a thorough review of program pur-

pose, planning, management, and performance activities. Although the Office of Science uses recognized processes such as competition and peer review, the PART process raised the question as to how we validate that these systems are working for our programs. As a result, all six Science programs are instituting a Committee of Visitors (COV) process that will bring in outside experts to evaluate the effectiveness of our competitive, peer review process in selecting excellent research programs. Basic Energy Sciences piloted the COV approach and is pleased with the specific actionable recommendations that resulted.

To meet the goals of the PMA, Science has undertaken a re-engineering effort that will flatten the organization and clarify roles and responsibilities. Science is also working toward improved electronic management systems and has begun to receive grant applications electronically—an important improvement for the research administrators in universities and not-for-profit institutions.

The Department has made a strong commitment to a results-driven, performance-based approach to management of itself and its government-owned, contractor-operated laboratories. Laboratory contracts are being renegotiated so that mutually agreed upon performance measures will result in increased contractor authority and accountability, while lessening the burden of DOE day-to-day oversight of activities. In January of this year, the Department announced that it will compete the management and operating contracts for seven of the DOE laboratories.

In September 2003, the Department issued its updated Strategic Plan and incorporated this Plan and the Performance Plan into the FY 2005 budget request. The performance measures included in this budget were developed with input from our scientific advisory committees and OMB. A website (www.sc.doe.gov/measures) has been developed to more fully explain the new measures within the context of each program.

SCIENCE PLANS AND PRIORITIES

The Office of Science plays four key roles in the U.S. research effort. *We provide solutions to our nation's energy challenges,* contributing essential scientific foundations to the energy, national, and economic security missions of the DOE. *We are the Nation's leading supporter of the physical sciences,* investing in research at over 280 universities, 15 national laboratories, and many international research institutions. *We deliver the premier tools of science to our nation's science enterprise,* building and operating major research facilities for open access by the science community. *We help keep the U.S. at the forefront of intellectual leadership,* supporting the core capabilities, theories, experiments, and simulations to advance science.

This FY 2005 budget request will set us on the path toward addressing the challenges that face our nation in the 21st Century. SC has recently released *Facilities for the Future of Science: A Twenty-Year Outlook* which sets an ambitious agenda for scientific discovery over the next two decades. The priorities established in this plan—which is clearly not a budget document—reflect national priorities set by the President and the Congress, our commitment to the DOE missions, and the views of the U.S. scientific community. Pursuing these priorities will be challenging, but they hold enormous promise for the overall well-being of all of our citizens. The FY 2005 request provides funding for the top five facility priorities in the plan as follows: ITER $7,000,000; Ultrascale Scientific Computing Capability $38,212,000; Joint Dark Energy mission $7,580,000; Linac Coherent Light Source $54,075,000; and Protein Production and Tags $5,000,000. There are multiple factors that will influence the realization of this plan, including available budgetary resources and other national priorities; nevertheless, it is our intention to proceed according to the plan's delineated priorities as circumstances allow.

We have recently released an updated *Office of Science Strategic Plan* that is fully integrated with the Facilities Plan, the Department's Strategic Plan, and the President's Management Agenda—including the R&D Investment Criteria and OMB's Program Assessment Rating Tool. The FY 2005 budget request begins to implement these plans.

I am increasingly mindful that the health and vitality of U.S. science and technology depends upon the availability of the most advanced research facilities. DOE leads the world in the conception, design, construction, and operation of these large-scale devices. These machines have enabled U.S. researchers to make some of the most important scientific discoveries of the past 70 years, with spin-off technological advances leading to entirely new industries. More than 19,000 researchers and their students from universities, other government agencies (including the National Science Foundation and the National Institutes of Health), private industry, and those from abroad use DOE facilities each year. These users are growing in both number and diversity.

Because of the extraordinarily wide range of scientific disciplines required to support facility users at national laboratories, and the diversity of mission-driven research supported by the Office of Science, we have developed an interdisciplinary capability that is extremely valuable to some of the most important scientific initiatives of the 21st Century. There is also a symbiotic relationship between research and research tools. Research efforts advance the capabilities of the facilities and tools that in turn enable new avenues of research.

Excluding funds used to construct or operate our facilities, approximately half of our research funding goes to support research at universities and institutes. Academic scientists and their students are funded through peer-reviewed grants, and SC's funding of university research has made it an important source of support for graduate students and postdoctoral researchers in the physical sciences during their early careers.

Mindful of the role that the Office of Science plays in supporting the physical sciences and other key fields, I would now like to briefly outline some specific investments that we are proposing in the FY 2005 Request.

SCIENCE PROGRAMS

ADVANCED SCIENTIFIC COMPUTING RESEARCH

FY 2004 Comparable Appropriation—$202.3M; FY 2005 Request—$204.3M

The Advanced Scientific Computing Research (ASCR) program significantly advances scientific simulation and computation. It applies new approaches, algorithms, and software and hardware combinations to address the critical science challenges of the future, and provides the Nation's scientific community with access to world-class, scientific computation and networking facilities. ASCR supports advancements in practically every field of science and industry. The ASCR budget also supports the *Scientific Discovery through Advanced Computing (SciDAC)* program—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 previously impossible using theoretical or laboratory studies alone.

The FY 2005 budget request includes $204.3 million for ASCR to advance U.S. leadership in high performance supercomputing and networks for science and to continue to advance the transformation of scientific simulation and computation into the third pillar of scientific discovery. The request includes $38.2 million for the *Next Generation Computer Architecture (NGA)* research activity, which is part of a coordinated interagency effort that supports research, development and evaluation of new architectures for scientific computers that could help enable continued U.S. leadership in science. Enhancements are supported for ASCR facilities—the Energy Sciences Network (ESnet) and the National Energy Research Scientific Computing Center (NERSC). The request also includes $8.5 million for the new *Atomic to Macroscopic Mathematics* research effort to provide the research support in applied mathematics needed to break through the current barriers in our understanding of complex physical processes.

BASIC ENERGY SCIENCES

FY 2004 Comparable Appropriation—$1,010.6M; FY 2005 Request—$1,063.5M

The Basic Energy Sciences (BES) program is a principal sponsor of fundamental research for the Nation in the areas of materials sciences and engineering, chemistry, geosciences, and bioscience as it relates to energy. This research underpins the DOE missions in energy, environment, and national security; advances energy-related basic science on a broad front; and provides unique user facilities for the scientific community and industry.

For FY 2005, the Department requests $1.1 billion for BES including $208.6 million to continue to advance nanoscale science through atomic- and molecular-level studies in materials sciences and engineering, chemistry, geosciences, and energy biosciences. This supports Project Engineering Design (PED) and construction of four Nanoscale Science Research Centers (NSRCs) and a Major Item of Equipment for the fifth and final NSRC. NSRCs are user facilities for the synthesis, processing, fabrication, and analysis of materials at the nanoscale. The request also includes $80.5 million for construction and $33.1 million for other project costs for the Spallation Neutron Source, and $54.1 million for research, development, PED, and long lead procurement of the Linac Coherent Light Source, a revolutionary x-ray free-electron laser light source. With these tools, we will be able to understand how the compositions of materials affect their properties, watch proteins fold, see chemical reactions, and design matter for desired outcomes.

The FY 2005 budget request also includes $29.2 million for activities that support the President's Hydrogen Fuel Initiative. This research program is based on the BES workshop report, *Basic Research Needs for the Hydrogen Economy,* which highlights the enormous gap between our present capabilities and those required for a competitive hydrogen economy.

BIOLOGICAL AND ENVIRONMENTAL RESEARCH

FY 2004 Comparable Appropriation—$641.5M; FY 2005 Request—$501.6M

The Biological and Environmental Research (BER) program advances energy-related biological and environmental research that has broad impacts on our health, our environment, and our energy future. The program includes components in genomics and our understanding of complete biological systems, such as microbes that produce hydrogen; in climate change, including the development of models to predict climate over decades to centuries; developing science-based methods for cleaning up environmental contaminants; in radiation biology, providing regulators with a stronger scientific basis for developing future radiation protection standards; and in the medical sciences, by developing new diagnostic and therapeutic tools, technology for disease diagnosis and treatment, non-invasive medical imaging, and biomedical engineering such as an artificial retina that will restore sight to the blind. For FY 2005, the Department requests $501.6 million for BER. The FY 2004 appropriation includes $140.8 million of one-time Congressionally-directed projects, for which no additional funds are being requested in FY 2005.

Research on microbes through the *Genomics: GTL* program, addressing DOE energy and environmental needs, continues to expand from $63.5 million in FY 2004 to $67.5 million in FY 2005. The request also provides $5 million for initiation of PED activities for the GTL Facility for the Production and Characterization of Proteins and Molecular Tags, a facility that will help move the *Genomics: GTL* systems biology research program to a new level by greatly increasing the rate and cost-effectiveness with which experiments can be done. DOE, through the *Genomics: GTL* program, will attempt to use genetic techniques to harness microbes to consume pollution, create hydrogen, and absorb carbon dioxide.

FUSION ENERGY SCIENCES

FY 2004 Comparable Appropriation—$262.6M; FY 2005 Request—$264.1M

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. This includes: 1) exploring basic issues in plasma science; 2) developing the scientific basis and computational tools to predict the behavior of magnetically confined plasmas; 3) using the advances in tokomak research to enable the initiation of the burning plasma physics phase of the Fusion Energy Sciences program; 4) exploring innovative confinement options that offer the potential of more attractive fusion energy sources in the long-term; 5) focusing on the scientific issues of nonneutral plasma physics and High Energy Density Physics; 6) developing the cutting edge technologies that enable fusion facilities to achieve their scientific goals; and 7) advancing the science base for innovative materials to establish the economic feasibility and environmental quality of fusion energy.

When the President announced that the U.S. would join in the International Thermonuclear Experimental Reactor (ITER) project he noted that "the results of ITER will advance the effort to produce clean, safe, renewable, and commercially available fusion energy by the middle of this century." To this end, the Department continues its commitment to the future of Fusion Energy Science research with a request of $264.1 million, slightly above the FY 2004 enacted level. Within that amount, $38 million is requested for preparations for ITER in FY 2005, $30 million more than in FY 2004. Of this $38 million, $7 million is for scientists and engineers who will support the International Team and for the qualification of vendors that will supply superconducting cable for ITER magnets. The remaining $31 million will be used to support refocused experiments in our tokamak facilities and for component R&D in our laboratories and universities that is closely related to our ongoing program but which is focused on ITER's specific needs. The researchers and facilities that we support will not be doing less work because of ITER, but some of their time and effort will be directed to different, ITER-related, work than they were doing before.

Multilateral negotiations are ongoing with respect to the specific ITER site, with two sites competing to host the facility. We are conducting technical assessments of both sites, and we fully expect to conclude this negotiation in a timely manner.

ITER construction funds are not required until FY 2006 which gives time for contingency planning, if necessary.

Fabrication continues on the National Compact Stellarator Experiment (NCSX), an innovative confinement system that is the product of advances in physics understanding and computer modeling. In addition, work will be initiated on the *Fusion Simulation Project* that, upon completion, will provide an integrated simulation and modeling capability for magnetic fusion energy confinement systems over a 15-year development period. The Inertial Fusion Energy research program will be redirected toward high energy density physics research based on recommendations that will come from the recently established Interagency Task Force on High Energy Density Physics.

HIGH ENERGY PHYSICS

FY 2004 Comparable Appropriation—$733.6M; FY 2005 Request—$737.4M

The High Energy Physics (HEP) program advances our understanding of the basic constituents of matter, including the mysterious dark energy and dark matter that make up most of the universe; the striking imbalance of matter and antimatter in the universe; and the possible existence of other dimensions. Collectively, these investigations will reveal the key secrets of the birth, evolution, and final destiny of the universe. HEP expands the energy frontier with particle accelerators to study fundamental interactions at the highest possible energies, which may reveal previously unknown particles, forces or undiscovered dimensions of space and time; explain how everything came to have mass; and illuminate the pathway to the underlying simplicity of the universe.

For FY 2005, the Department requests $737.4 million for the HEP program, an increase from FY 2004. The highest priority in HEP is the operation, upgrade and infrastructure for the two major HEP user facilities at the Fermi National Accelerator Laboratory (Fermilab) and the Stanford Linear Accelerator Center (SLAC), to maximize the scientific data generated.

In 2005, the Neutrinos at the Main Injector (NuMI) facility will be complete and the beam line will be commissioned. The FY 2005 budget request also supports research and design activities for a new Major Item of Equipment, the BTeV ("B Physics at the TeVatron") experiment at Fermilab that will extend current investigations, using modern detector technology to harvest a data sample more than 100 times larger than current experiments. Research and development work continues in FY 2005 on the proposed Supernova Acceleration Probe (SNAP) experiment for the DOE/NASA Joint Dark Energy Mission (JDEM).

NUCLEAR PHYSICS

FY 2004 Comparable Appropriation—$389.6M; FY 2005 Request—$401M

The Nuclear Physics (NP) program supports innovative, peer reviewed scientific research to advance knowledge and provide insights into the nature of energy and matter, and in particular, to investigate the fundamental forces which hold the nucleus together, and determine the detailed structure and behavior of the atomic nuclei. Nuclear science plays a vital role in studies of astrophysical phenomena and conditions of the early universe. At stake is a fundamental grasp of how the universe has evolved, an understanding of the origin of the elements, and the mechanisms of supernovae core collapse. The program builds and supports world-leading scientific facilities and state-of-the-art instruments necessary to carry out its basic research agenda. Scientific discoveries at the frontiers of Nuclear Physics further the Nation's energy-related research capacity, which in turn provides for the Nation's security, economic growth and opportunities, and improved quality of life.

The FY 2005 budget request of $401 million gives highest priority to exploiting the unique discovery potentials of the facilities at the Relativistic Heavy ion Collider (RHIC) and Continuous Electron Beam Accelerator Facility (CEBAF) by increasing operating time by 26 percent compared with FY 2004. R&D funding is provided for the proposed Rare Isotope Accelerator (RIA) and 12 GeV upgrade of CEBAF, which is located at Thomas Jefferson National Accelerator Facility.

Operations of the MIT/Bates facility will be terminated as planned, following three months of operations in FY 2005 to complete its research program. This facility closure follows the transitioning of operations of the Lawrence Berkeley National Laboratory 88-Inch Cyclotron in FY 2004 from a user facility to a dedicated facility for the testing of electronic circuit components for use in space (using funds from other agencies) and a small in-house research program. These resources have been redirected to better utilize and increase science productivity of the remaining user facilities and provide for new opportunities in the low-energy subprogram.

SCIENCE LABORATORIES INFRASTRUCTURE

FY 2004 Comparable Appropriation—$54.3M; FY 2005 Request—$29.1M

The Science Laboratories Infrastructure (SLI) program supports SC mission activities at SC laboratories by addressing needs related to general purpose infrastructure, excess facilities disposition, Oak Ridge landlord, health and safety improvements and payment in lieu of taxes (PILT).

The FY 2005 budget request supports three ongoing line item construction projects at Lawrence Berkeley National Laboratory, Brookhaven National Laboratory and the Stanford Linear Accelerator Center and nine projects to clean-up/remove 84,000 square feet of excess space to reduce operating costs, and environment, safety and health liabilities, and to free up land for future use. The request also supports activities to maintain continuity of operations at the Oak Ridge Reservation (ORR), including federal facilities in the town of Oak Ridge and PILT for local communities surrounding Oak Ridge. PILT is also provided to communities surrounding Brookhaven and Argonne East.

We have continued to work cooperatively with the Occupational Safety and Health Administration (OSHA) and the Nuclear Regulatory Commission (NRC) teams as they have conducted audits of our laboratories. NRC has completed its audits; OSHA is expected to complete its audits in mid-March 2004. The laboratories are preparing cost estimates to meet the requirements as identified by those agencies, and we plan to provide this information to Congress by May 31, 2004.

SAFEGUARDS AND SECURITY

FY 2004 Comparable Appropriation—$56.7M; FY 2005 Request—$67.7M

Safeguards and Security activities reflects the Office of Science's commitment to maintain adequate protection of cutting edge scientific resources and assets. The FY 2005 budget request includes $9.8 million for Pacific Northwest Site Office safeguards and security activities, which were transferred from the Office of Environmental Management. In FY 2005, Safeguards and Security will enable the Office of Science laboratories to meet the requirements of Security Condition 3 level mandates for the protection of assets. The request also provides the laboratories with the ability to maintain requirements of increased Security Condition 2 level for 60 days. The funding includes the increase needed to meet expectations of the revised Design Basis Threat approved by the Secretary in May 2003. In addition, critical cyber security investments will be made to respond to the ever changing cyber threat.

WORKFORCE DEVELOPMENT FOR TEACHERS AND SCIENTISTS

FY 2004 Comparable Appropriation—$6.4M; FY 2005 Request—$7.7M

The mission of the Workforce Development for Teachers and Scientists program is to continue the Office of Science's long-standing role of training young scientists, engineers, and technicians in the scientifically and technically advanced environments of our national laboratories.

The FY 2005 budget request of $7.7 million provides $1.5 million for a *Laboratory Science Teacher Professional Development* activity. About 90 participating teachers will gain experience and enhance their skills at five or more DOE laboratories in response to the national need for science teachers who have strong content knowledge in the classes they teach. A new $500,000 *Faculty Sabbatical Fellowship* activity will provide sabbatical opportunities for 12 faculty members from minority serving institutions (MSIs). This proposed activity is an extension of the successful *Faculty and Student Teams* (FaST) program where teams of faculty members and two or three undergraduate students, from colleges and universities with limited prior research capabilities, work with mentor scientists at a National Laboratory to complete a research project that is formally documented in a paper or presentation.

SCIENCE PROGRAM DIRECTION

FY 2004 Comparable Appropriation—$152.6M; FY 2005 Request—$155.3M

The mission of Science Program Direction is to provide a federal workforce, skilled and highly motivated, to manage and support basic energy and science-related research disciplines, diversely supported through research programs, projects, and facilities under the Office of Science's leadership.

Science Program Direction consists of two subprograms: Program Direction and Field Operations. The Program Direction subprogram is the single funding source for the SC federal staff in Headquarters responsible for directing, administering,

and supporting the broad spectrum of scientific disciplines. This subprogram also includes program planning and analysis activities which provide the capabilities needed to evaluate and communicate the scientific excellence, relevance, and performance of SC basic research programs.

The Field Operations subprogram is the centralized funding source for the SC federal workforce in the field who are responsible for providing business, administrative, and specialized technical support to SC and other DOE programs. Our service centers in Chicago and Oak Ridge provide primary support to SC laboratories and facilities, including Ames, Argonne National Laboratory, Brookhaven National Laboratory, Lawrence Berkeley National Laboratories, Oak Ridge National Laboratory, Pacific Northwest National Laboratory, Fermilab, Princeton Plasma Physics Laboratory, Thomas Jefferson National Accelerator Facility, and Stanford Linear Accelerator Center.

Secretary Abraham approved the Office of Science Restructuring (OneSC) on January 5, 2004. OneSC was initiated in July 2002 to embrace the changes envisioned by the President's Management Agenda (PMA) to accomplish government programs more economically and effectively by creating a new, more efficient, and productive SC organization. It will also provide a management environment in which the success and high performance of SC employees can continue in the face of changing resources, requirements, and societal needs.

The FY 2005 budget request of $155.3 million represents a 1.8 percent increase over the FY 2004 enacted level. This increase is reflected in salaries and benefits to support a total SC workforce of 1,014 full-time equivalents (FTEs). Compared to FY 2004, the FY 2005 request is flat or lower in our other major budget categories, such as travel, training, support services, and other related expenses. We will continue to leverage resources and rely on building good business practices by streamlining operations, improving financial controls, and re-engineering business processes in support of the PMA and the OneSC structure.

CONCLUSION

The Office of Science occupies a unique and critical role within the U.S. scientific enterprise. We fund research projects in key areas of science that our nation depends upon. We construct and operate major scientific user facilities that scientists from virtually every discipline are using on a daily basis, and we manage civilian national laboratories that are home to some of the best scientific minds in the world.

Our researchers are working on many of the most daunting scientific challenges of the 21st Century. These include pushing the frontiers of the physical sciences through nanotechnology and exploring the key questions at the intersection of physics and astronomy. We are also pursuing opportunities at the intersection of the physical sciences, the life sciences, and scientific computation to understand how the instructions embedded in genomes control the development of organisms, with the goal of harnessing the capabilities of microbes and microbial communities to help us to produce energy, clean up waste, and sequester carbon from the atmosphere. The Office of Science is also pushing the state-of-the-art in scientific computation, accelerator R&D, plasma confinement options and a wide array of other technologies that advance research capabilities and strengthen our ability to respond to the rapidly changing challenges ahead.

I want to thank you, Madam Chairman, for providing this opportunity to discuss the Office of Science's research programs and our contributions to the Nation's scientific enterprise. This concludes my testimony. I would be pleased to answer any questions you might have.

BIOGRAPHY FOR JAMES F. DECKER

James F. Decker is the Principal Deputy Director of the Office of Science (SC) in the Department of Energy (DOE). He has held this position since 1985, and has concurrently served as Acting Director for approximately six years on five separate occasions between April 1987 and March 2002. As Principal Deputy Director, Dr. Decker is the senior career executive who directs the day-to-day technical and management activities of an organization that is the third largest federal sponsor of basic research in the United States and is viewed as one of the premier science organizations in the world. The SC fiscal year 2002 budget of $3.3 billion funds programs in high energy and nuclear physics, basic energy sciences, magnetic fusion energy, biological and environmental research, and computational science. SC, formerly the Office of Energy Research, also provides management oversight of the Chicago and Oak Ridge Operations Offices, the Berkeley and Stanford Site Offices, and the ten DOE non-weapons laboratories. Dr. Decker has held several other positions within DOE. In 1973 he joined the Office of Fusion Energy, Office of Energy

Research, as a plasma physicist. He subsequently became the Director of the Division of Applied Physics, where he was responsible for all theoretical fusion and basic experimental plasma physics research, the magnetic fusion energy computer network, and evaluation of novel fusion concepts. Dr. Decker later served as a Special Assistant to the Director of the Office of Energy Research, and as the Director of the Scientific Computing Staff. Before joining DOE, Dr. Decker was a physicist at Bell Telephone Laboratories where he conducted research in plasma physics and worked on ion implantation for integrated circuit development. He received a B.S. degree from Union College in 1962, a M.S. degree from Yale University in 1963, and a Ph.D. in physics, also from Yale University, in 1967. Dr. Decker has received several awards from DOE as well as two Presidential Meritorious Rank Awards. He also is a member of several high-level domestic and international science policy advisory committees. Dr. Decker was born near Albany, New York. He is married and has two children.

Chairman BIGGERT. Thank you.

Dr. DECKER. Thank you.

Chairman BIGGERT. And without objection, it will be included in the record.

Mr. Garman, you may proceed.

STATEMENT OF MR. DAVID GARMAN, ASSISTANT SECRETARY FOR ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

Mr. GARMAN. Thank you, Madame Chairman, Members of the Subcommittee.

Knowing that my entire statement and specific answers to the questions posted by the Committee have been submitted and are available for the record, I will be brief.

The Department allocates more funding for the Office of Energy Efficiency and Renewable Energy than it does for any other energy program office. The overall EERE budget request for fiscal year 2005 is $1.25 billion, $15.3 million more than the fiscal year 2004 appropriation. And while overall spending is up, our spending for R&D is down slightly, and that is because we have again proposed to increase spending to help deploy some of the technologies that we have successfully developed.

It is important to appreciate the fact that we do a good deal more than R&D, and indeed, we must if we expect science and technology to make a difference in the lives of everyday Americans. And we have to make sure that it gets outside of the laboratory. My office's largest deployment activity is the low-income weatherization program, a Presidential priority, for which we have sought a $64 million increase. If Congress provides the $291.2 million we are seeking for this program, we will be able to help approximately 119,000 low-income homeowners lower their energy use, lower their energy bill, and thus allow them to use their limited incomes for other productive purposes. And this is particularly important since low-income Americans spend a disproportionately large share of their income on energy. Even with this unprecedented level of funding, we will only reach about half of the eligible families that have applied for assistance.

With that in mind, let me turn to that larger question of R&D versus deployment of technology. We have a variety of technologies that we have developed in the laboratories that is fair to say are still underutilized in the marketplace. Let us face it, many homebuilders build homes without the latest energy-saving technologies.

Many car makers build cars without the most efficient powertrain designs. Many industries choose not to use the most efficient process technology, and many consumers choose not to buy renewable electricity or the most efficient washing machines or refrigerators that they can buy. So spending more on R&D to develop technology does not, in and of itself, necessarily change this equation; we also have to look at the things we do through regulation, through incentives, and through outreach to get these technologies into more widespread use.

We are sometimes criticized for paying too much attention to R&D and not enough to the deployment activities. And I expect, frankly, that I will get a little heat today for doing too much in deployment and not enough in R&D. And frankly, the fact that we often get a hard time from both sides may be a sign that the portfolio of activities that we are engaged in is fairly balanced.

With that said, let me echo what Dr. Decker said, that if we greatly appreciate and value the efforts of this committee and this subcommittee to support our R&D efforts in national labs, universities, and industry, and we look forward to working with you to achieve and maintain an optimal balance between research, development, and deployment.

And I will be pleased to answer any questions the Committee has either today or in the future. Thank you.

[The prepared statement of Mr. Garman follows:]

PREPARED STATEMENT OF DAVID GARMAN

Chairman Biggert, Members of the Subcommittee, I appreciate the opportunity to testify on the FY 2005 President's Budget request for the Office of Energy Efficiency and Renewable Energy (EERE).

The Department allocates more funding for the Office of Energy Efficiency and Renewable Energy than it does for any other energy program office. The overall EERE budget request for FY 2005 is $1.25 billion, $15.3 million more than the FY 2004 appropriation.

My testimony today will specifically address each of the Subcommittee's questions.

1. Please provide the fiscal year 2004 enacted level and the President's fiscal year 2005 request for the following programs individually.

Industrial Technologies. The FY 2005 request for Industrial Technologies is $58.1 million, $35.0 million less than the FY 2004 appropriation. Our budget requests for this program have been consistent over the past several years as we have shifted some of this funding to the weatherization assistance program. We believe this is a proper and justifiable reprioritization. The industrial sector is already the most energy-efficient of our economy. Moreover, in contrast with low income Americans helped by the Weatherization Assistance Program, our energy intensive industrial partners are not only capable of implementing energy savings measures, they have "bottom-line" incentives to do so.

Beginning in FY 2005, the Department proposes to shift a portion of its R&D portfolio to focus on multi-industry *Grand Challenges* for next generation manufacturing and energy systems technologies. These *Grand Challenges* typically require high-risk investment for high-return gains to achieve much lower energy use than current processes. *Grand Challenges* examples include cokeless iron-making (steel industry); an alternative reduction technology to produce aluminum with less energy and emissions (aluminum industry); advanced melting technology (glass and metal casting industry); and distillation technologies (chemical industry).

Biomass and Biorefinery Systems R&D. Biomass and Biorefinery Systems R&D focuses on advanced technologies to transform the Nation's domestic biomass resources into high value chemicals, fuels, and power. In FY 2005, the Department is requesting $81.3 million for biomass program activities, which is $12.6 million less than the FY 2004 appropriation.. However, it is important to note that the FY 2004 appropriation required the use of $13 million in prior year balances, and most available balances were in the Biomass program. After accounting for the use of

prior year balances, the actual new budget authority provided to the Biomass program in FY 2004 was $75.0 million, just slightly more than our FY 2005 request. Moreover, the FY 2004 appropriation included nearly $41.0 million, or nearly half of the biomass budget, targeted to specific projects not identified in program plans. Congressional earmarking has delayed progress toward the program goals and diminished core research capabilities at the National Laboratories.

Our planned biomass activities are focused on advanced biorefinery technologies to produce low cost sugars, syngas and pyrolysis oils. In FY 2005, the thermochemical program will test the continuous production, cleanup and conditioning of biomass syngas and pyrolysis oils suitable for conversion to fuels, chemicals or hydrogen, and examine the production of hydrogen from biomass via synthesis gas. Work will continue with industry on improved process integration capabilities for industrial biorefineries, and the program will evaluate existing partnerships for more productive and lower-cost cellulase enzyme systems. Projects to test and evaluate the performance and costs of converting corn fiber to fuels and products will also continue. The program also supports ongoing R&D on processes for the production of chemicals and materials that can be integrated into biorefineries. Additional work with industry, universities and the national laboratories will focus on improvements to increase the efficiency of individual process steps.

Distributed Energy Resources. The Distributed Energy Resources Program leads a national effort to develop a flexible, smart, and secure energy system by integrating clean and efficient distributed energy technologies that complement the existing grid infrastructure. By producing electricity where it is used, distributed energy technologies can increase grid asset utilization and reduce the need for upgrading some transmission and distribution lines. Also, because distributed generators are located near the point of use, they allow for the capture of the waste heat produced by fuel combustion through combined heat and power systems.

In FY 2005, we are requesting $53.1 million, a $7.9 million reduction from the FY 2004 appropriation. This is consistent with our FY 2004 request. We are reallocating funding within the Distributed Energy Program's programmatic areas given advances made in previous years and changes within our overall energy R&D portfolio. Specifically, in the area of industrial gas turbines, we have chosen to curtail funding support for research involving hydrogen applications to avoid duplication of research. In the area of reciprocating engines, we are reducing the scope of our activities in areas that are perceived to be within private industry's capabilities. We are requesting less funding amount in the area of thermally-activated technologies, as the program is completing existing efforts on heat pumps and refrigeration in FY 2004.

Building Technologies. The FY 2005 request for the Building Technologies program is $58.3 million, a $1.6 million reduction from the current appropriation. Our solid state lighting research will create the technical foundation to revolutionize the energy efficiency, appearance, visual comfort, and quality of lighting products. Our FY 2005 request for solid state lighting is $10.2 million, a $5.0 million increase compared to FY 2004 appropriations.

Our request continues efforts to integrate renewable energy technologies into highly energy-efficient buildings that produce as much or nearly as much energy as they consume on an annual basis (zero energy buildings). We believe that a systems approach is necessary to better advance zero energy building technologies into the marketplace.

In FY 2005, the Department anticipates issuing rules regarding: minimum efficiency standards for electric distribution transformers; minimum efficiency standards for commercial central air conditioners; minimum efficiency standards for residential furnaces and boilers; and test procedures for electric distribution transformers.

Solar Energy Technology. The FY 2005 budget request for Solar Technology is $80.3 million. This is a slight increase over the unencumbered FY 2004 appropriation of $79.7 million, but slightly less than the total appropriation of $83.4 million, which included $3.6 million earmarked to specific recipients.

The photovoltaic program is focused on next-generation technologies such as thin-film photovoltaic cells and leap-frog technologies such as polymers and nanostructures. The FY 2005 request of $75.4 million for photovoltaic includes: $30 million for critical fundamental research, including $2.1 million to equip the new Science and Technology Facility at the National Renewable Energy Laboratory; $29 million for advanced materials; and $16.4 million for technology development efforts to improve reliability. The FY 2005 $2.9 million request for Solar Heating and

Lighting will support efforts on hot water and space heating for residential and commercial buildings in collaboration with industry partners.

Last year, we did not request funding for Concentrating Solar Power. In light of recent studies we sought from an independent engineering firm, a draft of which was reviewed by the National Research Council, the Department proposes $2 million for Concentrating Solar Power in FY 2005 to support a more thorough investigation of the appropriate R&D course needed to realize its potential. The FY 2005 budget request will maintain essential facilities and support work with several States while allowing us to develop a longer-term R&D plan.

Hydrogen, Fuel Cells and Infrastructure Technologies. The FY 2005 budget request for Hydrogen Technology is $95.3 million, a $13.3 million increase over the FY 2004 appropriation. Much of the proposed increase is for hydrogen safety research. This includes safety testing and analysis on bulk storage systems, fuel dispensing equipment, and piping to support new codes and standards specific to hydrogen. The Department has worked with the Department of Transportation and other agencies to coordinate efforts on hydrogen codes and standards. Under this activity, we will also develop system safety requirements for producing hydrogen and sensors to detect hydrogen leaks.

Research undertaken in the Hydrogen Technology Program is also targeted to reduce the cost of distributed hydrogen production from electrolysis and natural gas reformation. An enhanced focus on electrolysis, as recommended by the National Research Council, may lead to cost competitive production of hydrogen from renewable energy at $2.30 per gallon of gasoline equivalent by 2015.

One of the major technical obstacles we face is developing the means to store sufficient amounts of hydrogen aboard the vehicle to provide a driving range of greater than 300 miles. The FY 2005 budget provides funding for innovative storage technologies to be pursued under our "Grand Challenge" to leading universities and national laboratories so that we get the best minds at our universities and national labs to tackle this challenging problem.

The Hydrogen program is also stepping up its efforts on education at all levels, so Americans know what the hydrogen economy will mean for them, their businesses, and the environment, and understand how to handle hydrogen safely in their communities.

Our hydrogen work is well integrated with work in the Fuel Cell and Vehicle Technologies programs. Together, these programs represent the majority of the federal efforts comprising the Hydrogen Fuel Initiative, and we have published very specific, measurable technical goals against which to measure our progress. If we achieve our technical objectives, the automotive and energy industries will be in a position to consider commercialization by 2015, with mass market availability of both vehicles and refueling infrastructure by 2020.

However, while the FY 2004 EERE appropriation for hydrogen technology was approximately $82 million, roughly half of those funds were earmarked for specific projects that are not wholly consistent with our research plan or the recommendations of the National Research Council. As a consequence, we must delay some very important work in areas such as hydrogen storage and production. Thus our ability to meet our established research targets in the specified timeframes may be in jeopardy.

The FY 2005 request for Fuel Cell Technologies is $77.5 million, an increase of $12.3 million from the FY 2004 comparable appropriation. Fuel Cell technology plays an important role in both the FreedomCAR Partnership and the Hydrogen Fuel Initiative that seek to effect an industry decision by 2015 to commercialize hydrogen-powered fuel cell vehicles.

The major focus of the Fuel Cell Technology program continues to be high risk research and development to overcome technical barriers, centered on core research of key fuel cell components, with industry focused on engineering development of complete systems. The DOE effort funds major fuel cell suppliers, universities and national laboratories to develop materials and component technology aimed at lowering cost and improving durability, two major barriers to commercialization. Fuel cell research funded in this program is targeted to reduce the cost of transportation fuel cell systems by a factor of 10 from a 2003 baseline.

The FY 2005 Fuel Cell technology budget also continues support of our Vehicle Validation effort, a "learning" demonstration program that integrates real-world operation of real-world vehicles with the required refueling infrastructure provided by major energy suppliers (the refueling portion of this effort is funded through the Hydrogen Program). This effort will play a significant role in integrating fuel cell vehicle and hydrogen activities while helping us measure progress and determine remaining challenges.

Wind and Hydropower Technologies. The FY 2005 budget request for Wind Energy is $41.6 million, $290,000 more than the FY 2004 appropriation, which included $1.4 million in funds that were earmarked to specific recipients. The $12 million request for Low Wind Speed Technology research and development will support multiple large wind system technology pathways to achieve the goal of three cents per kilowatt-hour for onshore systems. It also supports new work in off-shore systems to help achieve a cost goal of five cents or less per kilowatt-hour. FY 2005 activities will include field testing of the first full-scale low wind speed technology prototype turbine and fabrication and testing of advanced drivetrains, power converter and blades for future low wind speed turbines. The $17 million request for supporting research and testing will engage the capabilities of the national labs, universities and private sector for technical support including both facility and field tests of newly developed components and systems to ensure design and performance compliance.

The FY 2005 budget request for Hydropower Technologies is $6.0 million, a $1.1 million or 22 percent increase over the FY 2004 appropriation. The Department's research approach involves a unique combination of computer modeling, instrumentation, lab testing and field-testing that is improving the design and operation of the next generation of hydropower technology. The request will support development of technologies that will enable hydropower operators at existing plants to generate more electricity with less environmental impact. This will be done through environmentally enhanced, improved efficiency turbines, as well as with new methods for optimizing unit, plant, and reservoir systems to increase energy production per unit water. Supporting research and testing will improve understanding of fish response to the physical stresses experienced in passage through turbine systems. The program will also explore ways to harness undeveloped hydropower capacity without constructing new dams.

Geothermal Technology. The FY 2005 budget request for Geothermal Technologies is $25.8 million, a $300,000 increase from the FY 2004 appropriation of $25.5 million, which included almost $2.0 million in funds that were earmarked to specific recipients. The program focuses on developing technology that optimizes the use of geothermal energy through improved exploration, drilling, reservoir engineering, and energy conversion. These technology improvements lead to cost-effective energy production at new geothermal fields and expanded production at existing fields.

FY 2005 resource development activities will characterize and assess the geothermal resource by understanding the formation and evolution of geothermal systems, including a collaborative effort with the U.S. Geological Survey on a national geothermal resource assessment. Activities in the Enhanced Geothermal Systems program seek to increase the productivity and lifetime of reservoirs, potentially more than doubling the amount of viable geothermal resources in the West. FY 2005 activities will include Enhanced Geothermal System field tests in California and Nevada, and tests of the Diagnostics-While-Drilling advanced drilling system in a high temperature geothermal well.

Weatherization & Intergovernmental Programs. In FY 2005, we are requesting $291.2 million for the Weatherization Assistance Program, $64.0 million more than the FY 2004 appropriation. This request supports the President's commitment to increase funding for the Weatherization Assistance Program by $1.4 billion over ten years. The FY 2005 request will support weatherization of approximately 119,000 low-income homes, saving $1.30 in energy costs for every dollar invested over the life of the homes. With this level of funding we reach about half of the eligible families that applied for assistance.

Intergovernmental activities promote rapid deployment of clean energy technologies and energy efficient products. The FY 2005 budget requests $40.8 million for State Energy Program grants. These grants and the funds they leverage allow State governments to target their own high priority energy needs and expand clean energy choices for their citizens and businesses.

The request for Gateway Deployment activities is $29.7 million, $5.4 million less than last year's appropriation. The 2002 reorganization brought these programs together under one umbrella with the hope that we would achieve synergies among the various programs, all aimed at delivering the full menu of efficiency and renewable resources with a clear community and customer focus. By shifting the emphasis from the program to the needs of the end user, we provide a "gateway" to a variety of specialized technical and financial assistance.

The International Renewable Energy Program provides technical assistance to support sustainable development and emerging market economies. In FY 2005, we request $6.5 million for international activities, a $612,000 increase from the FY

2004 appropriation, which included nearly $2.7 million in funds that were earmarked to specific recipients.

In FY 2005, we request $5.5 million for Tribal Energy Activities, an increase of $594,000 over the FY 2004 appropriation. The program provides assistance to Native American Tribes and Tribal entities in assessing energy resources, comprehensive energy plan development, energy technology training, and project development. Again, this is an area where Congressionally directed spending totaling $3.2 million, or more than half of our funding, inhibits our ability to provide competitive funding opportunities for tribes.

We are also requesting $4.0 million dollars for the Renewable Energy Production Incentive, which will create an incentive similar to the renewable production tax credits available to investor-owned utilities for public power providers.

Federal Energy Management Program. In FY 2005, we are requesting $19.9 million for the Federal Energy Management Program (FEMP), $1.8 million less than the FY 2004 appropriation. FEMP alternative financing programs have become a leading source of funds for agencies that need to meet their energy efficiency goals. Federal agencies access private sector financing to fund energy improvements through Energy Savings Performance Contracts (ESPC) and Utility Energy Service Contracts at no net cost to taxpayers.

As the Subcommittee knows, statutory authority for ESPCs expired on September 30, 2003. Without this valuable tool, it's highly unlikely that the Federal Government will be able to meet its energy efficiency and renewable energy goals without a substantial funding increase to support direct financing of energy efficiency and renewable energy projects. A permanent reauthorization of ESPCs was included in the comprehensive energy legislation passed by the House last year and we encourage Congress to reinstate this authority as soon as possible. In the absence of comprehensive legislation, we would support a stand-alone provision for the reauthorization of ESPCs.

The Departmental Energy Management Program specifically focuses on DOE facilities and operations. The FY 2005 request for Department Energy Management Program activities is $2.0 million, about the same as the FY 2004 appropriation.

FreedomCAR and Vehicle Technologies. In FY 2005, the Department is requesting $156.7 million for the Vehicle Technologies program, $21.3 million less than the FY 2004 comparable appropriation but comparable to our prior year request. Last year we were provided with additional funding for combustion engine and fuels research we did not seek.

Activities in this program contribute to two cooperative government/industry initiatives: the FreedomCAR Partnership and the 21st Century Truck Partnership. The FY 2005 request of $91.4 million for the vehicle technologies portion of the FreedomCAR Partnership focuses on advanced high-efficiency combustion engines and hybrid vehicle technologies such as high-powered batteries, materials and power electronics. This important work in engine and hybrid components can lead to short- and mid-term reductions in petroleum dependency and is also compatible with our long-term vision of affordable and widely available hydrogen fuel cell vehicles.

The 21st Century Truck Partnership has similar objectives but is focused on heavy vehicles. The partnership involves key members of the heavy vehicle industry, truck equipment manufacturers, hybrid propulsion developers, and engine manufacturers along with other federal agencies. The effort centers on improving and developing engine systems, heavy-duty hybrids, parasitic losses, truck safety, and idling reduction. The FY 2005 request for 21st Century Truck activities is $56.1 million.

2. This year's budget makes almost no mention of the Climate Change Technology Initiative. What has happened to the program, and why has the Administration decided to de-emphasize it?

The Administration remains committed to a comprehensive, innovative program of domestic and international initiatives to reduce greenhouse gas emissions. The Administration will spend more than $4 billion during this fiscal year on climate change science and technology R&D, about half of which is focused on climate change technology. For FY 2005, the Bush Administration has requested increases in a number of key investments, including the Hydrogen Fuel Initiative, Carbon Sequestration, Generation IV Nuclear Systems, and the International Thermonuclear Experimental Reactor. President Bush also supports an additional $4 billion in tax incentives to spur the use of clean, renewable energy and energy-efficient technologies.

The Fiscal Year 2005 EERE budget request includes $3 million to support a modest but important aspect of the President's National Climate Change Technology Initiative (NCCTI). This funding would be used to explore novel concepts, technologies

or technical approaches, not elsewhere considered that could, if successful, contribute in significant ways to the reduction, avoidance or permanent sequestration of greenhouse gas emissions. This funding would be used for competitive solicitations of research grant proposals and supporting analysis. In addition, the Administration's Climate Change Technology Program (CCTP), which helps implement the President's NCCTI, is developing a government-wide inventory of climate change technology research, development, and deployment so that NCCTI priorities can be identified. The new inventory will be based on a broad set of criteria and will be more comprehensive than previous crosscuts. To support the work of the CCTP (e.g., developing strategic planning documents, modeling, etc.), the Department requests $3 million within Renewable Energy Program Direction.

3. The President's Management Agenda (PMA) includes government-wide provisions on budget and performance integration that has [sic] been implemented through the Program Assessment and Rating Tool (PART). In addition, the PMA also introduced R&D Investment Criteria that were piloted in DOE's applied R&D programs. Please provide examples of how you prepared data under these requirements, how those data were used for budget and management decisions, and how these activities dovetail with the Government Performance and Results Act of 1993.

The principles of the R&D investment criteria, both the general criteria and the additional criteria for industry-relevant programs, have largely been incorporated into the R&D PART, implicitly and explicitly. For example, one PART question asks whether a program assesses and compares the potential benefits of efforts within the program and to efforts of other programs. In order to do so, the Department must develop a consistent framework for estimating public benefits, which we have been working on as part of the R&D investment criteria initiative for several years. Thus, to support the PART and the R&D investment criteria, the applied R&D programs continue to prepare benefits estimates, and to work on improving the comparability of these estimates through the use of common modeling techniques, assumptions, and scenarios.

Both the PART and the R&D investment criteria initiatives have been used to improve budget planning, development, and prioritization. For example, the PART and the R&D investment criteria highlight the importance of planning and prioritization. (An entire section of the PART is devoted to planning, and one of the R&D criteria is: "Programs must have complete plans, with clear goals and priorities.") In response, EERE enhanced its efforts to develop multi-year technology plans and roadmaps that chart a clear course for achieving program goals. The plans incorporate input from industry to ensure relevance and include off-ramps to ensure that we don't continue R&D pathways that are not promising. Most EERE programs are also now using independent peer reviews to ensure the quality and performance of their R&D projects and to help identify priorities. Clearly, the PART and the R&D investment criteria have furthered the Department's efforts to pursue sound management practices and improve program performance.

Application of the criteria has also played an important part in our funding decisions. For example, we reduced support for activities in programs that help certain industries that have the ability and incentive to conduct energy-efficiency research on their own (e.g., Industrial Technology Program). We have also emphasized areas not as inclined to attract private investment without federal leadership (e.g., fuel cell activities). Also, our Buildings Technology program was refocused to support longer-term, breakthrough technologies that can have a dramatic impact, such as solid state lighting, and reduce support for energy-efficient technologies available on the shelf today for builder and consumer use.

The Government Performance and Results Act and PART requirements are alike in many ways, perhaps most importantly in that they both require articulation of measures and targets and an assessment of performance against those targets. The PART goes beyond GPRA by standardizing an evaluation process for programs based on purpose, planning, and management as well as results. The PART enhances and complements GPRA.

4. Using the definitions in OMB Circular A–11, what is the proposed mix of funding in the fiscal year 2005 budget request between basic research, applied research, development, demonstration, and deployment activities for your office? Please provide the comparable fiscal year 2004 numbers for comparison.

The table below presents the information that was submitted to OMB's MAX database for the A–11 R&D "character classifications." It should be noted that A–

11 only includes definitions for basic research, applied research, and development, and those are the only three R&D character classes for which OMB collects data.

	(budget authority in thousands)		
	FY 2003	FY 2004	FY 2005
Energy Efficiency and Renewable Energy			
Basic Research	30,577	31,115	30,092
Applied Research	279,895	303,533	269,228
Total, Research	310,472	334,648	299,320
Development	371,842	394,614	345,608
R&D Equipment	5,415	6,086	5,450
R&D Facilities	770	4,000	7,500
Total, Research and Development	688,499	739,348	657,878

EERE's has also estimated deployment expenditures for Fiscal Years 2003–2005 as shown below.[1] Because demonstrations can support both development and deployment, we do not identify "demonstration" as a separate category.

	(budget authority in thousands)		
	FY 2003	FY 2004	FY 2005
Energy Efficiency and Renewable Energy			
Deployment	428,951	430,347	471,329

In conclusion, we believe the Administration's FY 2005 budget request for energy efficiency and renewable energy technologies reflects a robust, balanced and consistent approach toward meeting the Nation's energy goals of increased energy security through utilization of diverse domestic supplies, greater freedom of choice of technology, and reduced financial costs and environmental impacts of energy utilization.

Through the use of research and development investment criteria, we are not only mindful of how much we spend on these programs, but also the manner in which we operate and the results we are achieving. We are increasingly successful in linking our expenditures with performance and results. We are striving to achieve more work in the laboratory with every research and development dollar entrusted to our stewardship.

This completes my prepared statement, and I am happy to answer any questions the Subcommittee may have.

BIOGRAPHY FOR DAVID GARMAN

David Garman was nominated by President George W. Bush to serve as Assistant Secretary on April 30, 2001 and was confirmed unanimously by the United States Senate on May 25, 2001.

Assistant Secretary Garman leads the Office of Energy Efficiency and Renewable Energy (EERE) comprised of over 500 federal employees in Washington, DC and six regional offices, supported by thousands of federal contractors both in and outside the National Laboratories. EERE's $1.2 billion technology portfolio is the largest energy research, development, demonstration and deployment portfolio at the Department of Energy.

Assistant Secretary Garman was instrumental in the development of the FreedomCAR cooperative automotive research partnership and the President's Hydrogen Fuel Initiative. In recognition of his role, he was awarded the National Hydrogen Association's 2002 Meritorious Service Award, and the Electric Drive Vehicle Association's 2003 "E–Visionary" Award. Concurrent with his duties as Assistant

[1] These numbers include the full budget for the Weatherization and Intergovernmental Program (WIP), including activities that are not authorized by the Science Committee, such as Weatherization Assistance, the State Energy Program, Cooperative Programs with States (FY03), and others. The WIP share of the deployment funding shown here is $310 million in FY 2003, $304 million in FY 2004, and $362 million in FY 2005.

Secretary, Garman also serves as Chairman of the FreedomCAR Executive Steering Committee and as Chairman of the Steering Committee for the 15-nation International Partnership for a Hydrogen Economy.

During his tenure at the Department, Mr. Garman has reorganized the Office of Energy Efficiency and Renewable Energy, replacing an outdated and fragmented organization with what is arguably the most innovative business model ever employed in the Federal Government. The new EERE organization is comprised of fewer management layers, is more agile, and is focused on results rather than process. The new organization has been recognized as a success by the White House and the National Association of Public Administration. In fully implementing the new business model in accordance with the President's Management Agenda, Assistant Secretary Garman is continuing his emphasis on increasing program manager accountability, reducing administrative overhead, and getting more work performed with each taxpayer dollar.

Prior to joining the Department of Energy, Mr. Garman served in a variety of positions on the staff of two U.S. Senators and two Senate Committees during a career spanning nearly 21 years, including service on the Professional Staff of the Senate Select Committee on Intelligence and the Senate Committee on Energy and Natural Resources. Immediately prior to his current position, Mr. Garman was Chief of Staff to Frank Murkowski, then Chairman of the Energy and Natural Resources Committee, now Governor of Alaska. In addition to his normal Senate duties, Mr. Garman represented the Senate leadership at virtually all of the major negotiations under the United Nations Framework Convention on Climate Change from 1995–2000.

Assistant Secretary Garman has testified before Congress as an Administration witness on more than twenty-five occasions; and been featured as a key Administration spokesman on future energy technologies in print, television and radio. He holds a Bachelor of Arts in Public Policy from Duke University, and a Master of Science in Environmental Sciences from the Johns Hopkins University.

Chairman BIGGERT. Thank you.

Now Mr. Maddox is recognized.

STATEMENT OF MR. MARK R. MADDOX, ACTING ASSISTANT SECRETARY FOR FOSSIL ENERGY, U.S. DEPARTMENT OF ENERGY

Mr. MADDOX. Madame Chairman, Members of the Subcommittee, it is a pleasure to join you today to present the Office of Fossil Energy's fiscal year 2005 budget submission. The Department appreciates the support of the Chairman and the Members of the Subcommittee over the past years, and I look forward to working with you in the future.

With your permission, I propose to submit a detailed discussion of the budget request, including my remarks to an overview of our programs and projects being—before answering your questions.

Our 2005 budget request demonstrates continued progress in the realignment of our program to achieve the President's goal of a cleaner environment and a secure energy future. We are committed to supporting the development of efficient, cost-effective, pollution-control technologies as part of the President's Clean Coal Research Initiative and to meeting rapidly increasing demand for clean-burning natural gas by diversifying the Nation's future sources of natural gas. We are committed to developing technological solutions that will reduce greenhouse gas emissions by increasing power plant efficiencies, capture and permanently store emissions from energy production, and produce new greenhouse gas-free fuel, such as hydrogen, and means of energy production, such as fuel cells. And we are committed, under energy security, to getting the maximum benefit from our domestic resources of coal, natural gas, and oil to ensuring an effective, short-term emergency response to our

energy needs with the strategic petroleum reserve and other emergency reserves and to developing the amazing, long-term potential of hydrogen and methane hydrates as alternatives to our current reliance on imported oil.

Success in achieving these goals will help to ensure the clean energy our nation needs to fuel continued economic growth and job creation. We have reconfigured the fossil energy budget to focus on the future of coal, our most abundant domestic energy resource. The President's $2 billion, 10-year coal research initiative is proof of the importance of coal to our energy in the future. In fact, President Bush's leadership coal R&D budget requests are more than double past requests in appropriations.

Fossil Energy's 2005 Clean Coal Research budget request increases to $447 million, 40 percent more than last year's $320 million request. Within the President's Coal Research Initiative, Clean Coal Power Initiative, designed to address the reliability and affordability of the Nation's electric—electricity supply, particularly from coal-based generation. The budget includes $287 million for CCPI, of which $237 million is for FutureGen. We plan, with strong private sector partnership, to build and operate a high-efficiency, 275-megawatt plant using combined cycle, carbon sequestration, fuel cell, and other advanced technologies to produce both electricity and hydrogen with virtually no polluting or greenhouse gas emissions. Our budget request includes funding to begin site selection and secure environmental permits for the plant by proving the feasibility of producing electricity and hydrogen from coal with zero emissions.

Early last year, we announced the first round results of the Clean Coal Power Initiative, eight projects for innovative power plant technologies with a total value of more than $1.3 billion with more than $1 billion coming from private sector. Our 2005 budget includes requests for a second round of funding. The 2005 request includes $49 million for research into carbon sequestration, one of Fossil Energy's top research priorities, $16 million for research into new methods for making hydrogen from coal, and $23 million for continued development of lower-cost fuel cells.

The Administration has been working on several fronts to increase domestic natural gas production, promote more efficient consumption, and attract new supply to international energy trading partners. Fossil Energy's Natural Gas Technology Program, budgeted at $26 million for 2005, is concentrated on creating economic technologies that will allow access with minimal environmental effects to new domestic reserves of natural gas.

Natural gas storage will assume increasing significance in the United States as more and more power plants require consistent year-round supplies of natural gas. This, then, will initiate a nationwide, industry-led consortium that will examine ways to improve the reliability and efficiency of our nation's gas storage system and explore opportunities for LNG siting.

Over the long-term, the production of natural gas from hydrates could have major energy security implications. Hydrates are natural gas-bearing, ice-like formations in Alaska and offshore, as well as many other parts of the world.

Fossil fuels have been the dominant—have a role in America's energy story today, and they will continue to dominate for decades to come. Our job, at Fossil Energy, is to help ensure dependable, affordable, and environmentally sound supply of the coal, oil, and natural gas we need to meet increasing energy demands.

Thank you.

[The prepared statement of Mr. Maddox follows:]

PREPARED STATEMENT OF MARK R. MADDOX

Introduction

Mr. Chairman, Members of the Subcommittee, it is a pleasure to join you today to present the Office of Fossil Energy's FY 2005 budget submission and to focus on the details that fall under the purview of this subcommittee. The Department appreciates the support of the Chairman and the Members of the Subcommittee over the past years and I look forward to working with you on budget issues related to the Fossil Energy Program.

The Office of Fossil Energy

Mr. Chairman, as the Nation strives to break its continued reliance on imported energy sources, Fossil Energy is leading the way by seeking new energy technologies and methodologies that promote the efficient and environmentally sound production and use of fossil fuels.

The United States relies on fossil fuels for about 85 percent of the energy it consumes and forecasts indicate U.S. reliance on these fuels could exceed 87 percent in 2025.

Accordingly, a key goal of DOE's fossil energy activities is to ensure that economic benefits from moderately priced fossil fuels and a strong domestic industry that creates jobs are compatible with the public's expectation for exceptional environmental quality and reduced energy security risks. This includes promoting the development of energy systems and practices that will provide current and future generations with energy that is clean, efficient, reasonably priced, and reliable.

Fossil Energy's programs focus on supporting the President's top initiatives for energy security, clean air, climate change, and coal research. FY 2005 Fossil Energy programs:

- Support the development of lower cost, more effective pollution control technologies embodied in the President's Coal Research Initiative or help diversify the Nation's future sources of clean-burning natural gas to meet the goals of the President's Clear Skies Initiative;
- Expand the Nation's technological options for reducing greenhouse gases either by increasing power plant efficiencies or by capturing and isolating these gases from the atmosphere as called for by the President's Global Climate Change Initiative;
- Or measurably add to the Nation's energy security by providing a short-term emergency response, such as the Strategic Petroleum Reserve, or a longer-term alternative to imported oil, such as hydrogen and methane hydrates.

The President's Coal Research Initiative

Fossil Energy's FY 2005 Budget continues to meet the President's clean coal commitment by providing $447 million for the President's Coal Research Initiative, an increase of 40 percent or $126.5 million over last year's request.

Under President Bush's leadership, budget requests for coal R&D have more than doubled over historical amounts and appropriations.

Clean Coal Power Initiative and FutureGen—Within the President's Coal Research Initiative, the Clean Coal Power Initiative (CCPI) is a key component of the National Energy Policy to address the reliability and affordability of the Nation's electricity supply, particularly from its coal-based generation. The FY 2005 Budget includes $287 million for CCPI, of which $237 million is for FutureGen, the world's first zero-emissions hydrogen and electricity producing power plant. FutureGen will establish the technical feasibility and economic viability of co-producing electricity and hydrogen from coal with near zero emissions, including carbon sequestration and gasification combined cycle, both integral components of the zero emissions plant of the future.

The CCPI is a cooperative, cost-shared program between the government and industry to rapidly demonstrate emerging technologies in coal-based power generation

and to accelerate their commercialization. The Nation's power generators, equipment manufacturers, and coal producers help identify the most critical barriers to coal's use in the power sector. Technologies are selected with the goal of accelerating development and deployment of coal technologies that will economically meet environmental standards, while increasing the efficiency and reliability of coal power plants.

CCPI is especially significant because it directly supports the President's Clear Skies Initiative. The first projects included an array of new cleaner and cheaper concepts for reducing sulfur dioxide, nitrogen oxides, and mercury—the three air pollutants targeted by the Clear Skies Initiative.

Since last year, the Department has made significant progress on a new generation of environmentally-clean coal technologies.

The "first round" in the Clean Coal Power Initiative—the centerpiece of the President's clean coal commitment—attracted three dozen proposals for projects totaling more than $5 billion. In early 2003, we announced the first winners of the competition—eight projects with a total value of more than $1.3 billion, more than one billion dollars of which would be provided by the private sector. These projects are expected to help pioneer a new generation of innovative power plant technologies that could help meet the President's Clear Skies and climate change objectives.

A competitive solicitation for the "second round" was be made in early 2004 and is open to coal-based technologies capable of producing any combination of heat, fuels, chemicals, or other useful by-products in conjunction with electricity generation. Interested proposers have until June 15, 2004 to submit their proposals.

To contribute to the success of FutureGen, the President's Coal Research Initiative also includes supporting research programs in FY 2005 at a proposed level of $160 million. It will be focused on all the key technologies needed—such as carbon sequestration membrane technologies for oxygen and hydrogen separation, advanced turbines, fuel cells, coal to hydrogen conversion, gasifier related technologies, and other technologies.

Carbon Management—Several Clean Coal projects also help expand the menu of options for meeting the President's climate change goal of an 18 percent reduction in greenhouse gas intensity (carbon equivalent per GDP) by 2012, primarily by boosting the efficiencies of power plants (meaning that less fuel is needed to generate electricity with a corresponding reduction in greenhouse gases).

Carbon management has become an increasingly important element of our coal research program. Carbon sequestration—the capture and permanent storage of carbon dioxide—has emerged as one of our highest priorities in the Fossil Energy research program—a priority reflected in the proposed budget of $49 million in FY 2005.

Continuing in FY 2005, one of the cornerstones of our carbon sequestration program will be a national network of regional partnerships. This Secretarial initiative, announced last year, is bringing together the Federal Government, state agencies, universities, and private industry to begin determining which options for capturing and storing greenhouse gases are most practicable for specific areas of the country.

Hydrogen—Another aspect of the President's Clean Coal Research Initiative is the production of clean fuels from coal. Hydrogen has emerged as a major priority within the Administration and the Department of Energy as a clean fuel for tomorrow's advanced power technologies (such as fuel cells) and for future transportation systems. Within the Fossil Energy program, we have allocated $16 million for research into new methods for making hydrogen from coal.

Advanced Research—To provide fundamental scientific knowledge that benefits all of our coal technology efforts, our FY 2005 Budget includes $30.5 million for advanced research in such areas as materials, coal utilization science, analytical efforts, and support for coal research at universities (including historically black and other minority institutions).

Other Power Systems Research and Development—We are also proposing $23 million for continued development of fuel cells with an emphasis on lower-cost technologies that can contribute to both Clear Skies emission reductions, particularly in distributed generation applications, and Climate Change goals by providing an ultra-high efficiency electricity-generating component for tomorrow's power plants. Distributed power systems, such as fuel cells, also can contribute to the overall reliability of electricity supplies in the United States and help strengthen the security of our energy infrastructure.

Natural Gas Research—The President's Clear Skies Initiative also provides the rationale for much of the Department's $26.0 million budget request for natural gas

research. Even in the absence of new environmental requirements, natural gas use in the United States is likely to increase by 50 percent by 2020.

Our natural gas research program, therefore, is directed primarily at providing new tools and technologies that producers can use to diversify future supplies of gas. Assessment of the natural gas program under the Program Assessment Rating Tool (PART) found that the program often duplicated private sector R&D, and that the program lacks a rigorous peer review process. As a result the program is being refocused on areas where there is little private sector effort, or that are long-term, high risk. Emphasis will be increased on research that can improve access to onshore public lands, especially in the Rocky Mountain region where much of our undiscovered gas resource is located. A particularly important aspect of this research will be to develop innovative ways to recover this resource while continuing to protect the environmental quality of these areas.

Natural gas storage will also assume increasing significance in the United States as more and more power plants require consistent, year-round supplies of natural gas. Toward this end, we will initiate a nationwide, industry-led consortium that will examine ways to improve the reliability and efficiency of our nation's gas storage system and explore opportunities for LNG facility siting.

Over the long-term, the production of natural gas from hydrates could have major energy security implications. Hydrates are natural gas-bearing, ice-like formations in Alaska and offshore.

U.S. Geological Survey estimates indicate U.S. gas hydrates resources are larger by several orders of magnitude than previously thought and dwarf the estimated 1,400 trillion cubic feet of conventional recovered gas resources and reserves in the United States.

This huge resource warrants a new look at advanced technologies that might one day reliably and cost-effectively detect and produce natural gas from methane hydrates.

Hydrate production, if it can be proved technically and economically feasible, has the potential to shift the world energy balance away from the Middle East. Understanding hydrates can also improve our knowledge of the science of greenhouse gases and possibly offer future mechanisms for sequestering carbon dioxide. For these reasons, we are continuing a research program to study gas hydrates with a proposed funding level of $6.0 million.

Oil Technology Development

The President's National Energy Policy (NEP) calls attention to the continued need to strengthen our nation's energy security by promoting enhanced oil (and gas) recovery and improving oil (and gas) exploration technology through continued partnerships with public and private entities.

At the same time, however, we recognize, as supported by evaluation under the Program Assessment Rating Tool (PART), that if the federal oil technology R&D program is to produce beneficial results and not duplicate private sector efforts, it must be more tightly focused than in prior years. Consequently, our FY 2005 Budget request of $15.0 million reflects a re-orientation of the program toward those areas where there is clearly a national benefit.

One example is the use of carbon dioxide (CO_2) injection to enhance the recovery of oil from existing fields. CO_2 injection is a proven enhanced oil recovery practice that prolongs the life of some mature fields, but the private sector has not applied this technique to its fullest potential due to insufficient supplies of economical CO_2. A key federal role to be carried out in our proposed FY 2005 program will be to facilitate the greater use of this oil recovery process by integrating it with CO_2 captured and delivered from fossil fuel power plants.

We will also refocus much of our Oil Technology program on a new Domestic Resource Conservation effort that will target partnerships with industry and universities to sustain access to marginal wells and reservoirs. These aging fields account for 40 percent of our domestic production and contain billions of barrels of oil that might still be recovered with ever-improving technology.

A high priority effort in FY 2005 will be to develop "micro-hole" technology. Rather than developing just another new drilling tool, the federal program will integrate "smart" drilling systems, advanced imaging, and enhanced recovery technologies into a complete exploration and production system. Micro-hole systems may offer one of our best opportunities for keeping marginal fields active because the smaller-diameter wells can significantly reduce exploration costs and make new drilling between existing wells ("infill" drilling) more affordable.

Using breakthrough technology like this to keep marginal fields in production preserves the opportunity to eventually apply even more advanced innovations that

could recover even larger quantities of domestic crude that traditional oil recovery methods currently leave behind.

Other Fossil Energy Activities

Our budget also includes $124.8 million for other activities in our Fossil Energy program, including $106.0 million for headquarters and field office salaries, $6.0 million for environmental restoration, $3.0 million for federal matching funds for cooperative research and development projects at the University of North Dakota and the Western Research Institute, $1.8 million for natural gas import/export responsibilities, and $8 million for advanced metallurgical research at our Albany Research Center.

Petroleum Reserves

The Office of Fossil Energy is also responsible for our nation's petroleum reserves. Our FY 2005 Budget includes $172.1 million for the Strategic Petroleum Reserve, $5 million for the Northeast Home Heating Oil Reserve, and $20 million for the Naval Petroleum and Oil shale Reserves.

Closing

Mr. Chairman, as I stated at the outset, Fossil Energy's programs are structured to promote the development of energy systems and practices that will provide current and future generations with energy that is clean, efficient, reasonably priced, and reliable. And our focus is on supporting the President's top initiatives for energy security, clean air, climate change, and coal research. Accordingly, I believe our FY 2005 budget submission meets these critical needs for energy, environmental and national security at a difficult time in our history.

Mr. Chairman, and Members of the Subcommittee, this completes my prepared statement. I would be happy to answer any questions you may have at this time.

BIOGRAPHY FOR MARK R. MADDOX

Mark R. Maddox currently serves as Acting Assistant Secretary in the Office of Fossil Energy for the U.S. Department of Energy, a position he was named to on March 1. 2004.

As Acting Assistant Secretary, Maddox is involved in several high-priority Presidential initiatives including implementation of the Administration's $2 billion, 10-year initiative to develop a new generation of environmentally sound clean coal technologies, the $1 billion *FutureGen* project to develop a pollution-free plant to co-produce electricity and hydrogen, and the Nation's Strategic Petroleum Reserve and Northeast Home Heating Oil Reserve, both key emergency response tools available to the President to protect Americans from energy supply disruptions.

The Energy Department's Office of Fossil Energy is made up of about 1,000 scientists, engineers, technicians and administrative staff with headquarters offices in Washington, DC, and in Germantown, Maryland. Fossil Energy also has field offices in Morgantown, West Virginia; Pittsburgh, Pennsylvania; Tulsa, Oklahoma; New Orleans, Louisiana; Casper, Wyoming; and Albany, Oregon.

Maddox joined the Office of Fossil Energy in September 2003 when he was named Principal Deputy Assistant Secretary. Previously, Maddox served as a Senior Policy Advisor to U.S. Secretary of Energy Spencer Abraham where he was responsible for advising on fossil energy and environmental management program issues, as well as on communications strategy.

Maddox was Deputy Director of Public Affairs at the Department of Energy during the George H.W. Bush Administration, where he helped design and implement the strategic communication plan for the Persian Gulf War, directed the Department's crisis communications planning, and supervised the public affairs activities of its field sites.

Prior to returning to public service in 2002, Maddox was Director of Communications and Public Affairs for the IMS division of Lockheed Martin, Inc., now Affiliated Computer Services State and Local Solutions, Inc. In these roles he participated in developing the division's political and legislative strategies, served as spokesman, and developed the division's communications strategies.

Before joining Lockheed Martin, Maddox was a Vice President for a mid-size Washington, D.C., lobbying firm where he represented clients on a variety of issues.

He has served as the Chief of Staff to a member of the U.S. House Commerce Committee where he was active on telecommunications, electricity deregulation and other issues under committee jurisdiction. He has also worked as a Press Secretary in Congress and local government.

Maddox holds an MBA from George Washington University and a Bachelor of Science in Journalism from Bowling Green State University in Ohio. An Ohio native, he resides in Alexandria, VA, with his wife and two children.

Chairman BIGGERT. Thank you very much.

And now, Mr. Magwood.

STATEMENT OF MR. WILLIAM D. MAGWOOD, IV, DIRECTOR OF THE OFFICE OF NUCLEAR ENERGY, SCIENCE AND TECHNOLOGY, U.S. DEPARTMENT OF ENERGY

Mr. MAGWOOD. Thank you, Madame Chairman.

Excuse me. It is a pleasure to be here this morning to discuss the President's 2005 budget request for the Office of Nuclear Energy, Science and Technology. I have provided a written statement for the record, but would like to make a few opening remarks.

In fiscal year 1998, the Nation's Nuclear Energy Research Program had come to a virtual standstill. In that year, federal funding for nuclear energy research and development fell essentially to zero. It was also a year when the number of students entering nuclear engineering disciplines in this country plummeted from around 1,500 only five years earlier to an all-time low of only about 500. It was a year when the international community began to turn away from the U.S. as the source of leadership in nuclear technology issues.

Since that time, the Department, with the help and support and counsel of many Members of Congress, particularly this subcommittee and its Chairman, has worked hard to refocus and reinvent our efforts to create a better, stronger program. I believe we have been effective. Not only is our nuclear energy research budget higher than it has been since the early 1990's, but nuclear engineering education is resurging in the U.S. with nearly 1,400 students now studying in schools across the country. We have reasserted U.S. leadership in the international community. In way of example, I note that, as a representative of the United States, I have been elected to—by my international colleagues, to share—to serve as chair of two international bodies, the OECD's Steering Committee on Nuclear Energy, and the Generation IV International Forum. The U.S. is, once again, setting the pace for international cooperation partnership.

The Department's fiscal year 2005 request for the nuclear energy program proposes a $410 million investment to continue this progress. Our request supports development of new nuclear generation technologies and advanced energy products that provide significant improvements in sustainability, economics, safety, reliability, and proliferation resistance.

A good example is our Generation IV program. This effort continues to make significant progress. Since the Generation IV International Forum and the Nuclear Energy Research Advisory Committee issued their joint report, "A Technology Roadmap for Generation IV Nuclear Energy Systems," the members of the Forum have expanded to include Switzerland and the European Union. The members of the Forum have organized into interest groups associated with each of the six selected Generation IV systems and are, at this very time—very moment, negotiating groundbreaking,

international, multi-lateral agreements that will enable advanced nuclear research to be conducted jointly by multiple countries.

The Generation IV technologies emerging from this work will not only be safe, economic, and secure, but will also include energy conversion systems that produce valuable commodities, such as hydrogen, fresh water, and process heat. These features make Generation IV reactors ideal for meeting the President's energy and environmental objectives.

With that in mind, we have focused the bulk of our $30.5 million request for Generation IV on the development of the Next Generation Nuclear Plant, an advanced facility that would produce both hydrogen and electricity with great efficiency. We are exploring the potential of an international public/private project to build and operate a pilot NGNP at the Department's Idaho site.

While the Department has not, at this time, made a final decision to proceed with this effort, such a project would be valuable to validate the potential of technology to meet the goals highlighted in the President's National Hydrogen Fuel Initiative. If successful, this technology could produce hydrogen at a cost that is competitive with gasoline and electricity at a cost that is competitive with advanced natural gas powered systems.

Moreover, a pilot project would energize our efforts to build the Idaho National Laboratory into a world-class nuclear research center. While this research and development project would involve several of our national laboratories, most of the work would be conducted in Idaho and serve to attract the talent and capabilities necessary for the long-term success of the laboratory.

We have released a draft RFP to search for a contractor to help us develop this new lab into one of the world's premier nuclear engineering research and development centers within 10 years. A final RFP will be issued in early April.

I believe it is important to highlight, however, that if the INL is to become the essential lab in our nuclear research endeavors, it will not be the only lab. We believe that the talent of scientists and engineers at labs, such as Argonne National Lab, Oak Ridge, Los Alamos, and others, will remain essential and irreplaceable contributors to our nuclear research efforts now and into the future.

We have designed a program that ensures both the preservation of nuclear power in the near-term in the United States and its long-term growth as a major source of economic and environmentally smart energy.

I look forward to your questions today about our 2005 request and to working with you to implement these programs to the benefit of the Nation.

Thank you.

[The prepared statement of Mr. Magwood follows:]

PREPARED STATEMENT OF WILLIAM D. MAGWOOD, IV

Chairman Biggert, Mr. Larson, and Members of the Subcommittee, it is a pleasure to be here to discuss the Fiscal Year (FY) 2005 budget submission for DOE's Office of Nuclear Energy, Science and Technology.

The program has made a great deal of progress over the past several years. From the time, not so many years ago, when it appeared that the United States might abandon advanced nuclear research and development, we have been successful in reasserting U.S. leadership in the world. Representing the United States, I have been elected by my international colleagues to serve as the Chair of two important

international bodies—the OECD Steering Committee on Nuclear Energy and the Generation IV International Forum. When it appeared that nuclear power's era had ended in the United States, nuclear utilities have turned their programs around, making more energy last year than at any time in history and launching into very serious discussions to explore the construction of new plants for the first time in decades.

Recent developments have been encouraging. The Department has launched the process of establishing a central laboratory for nuclear research and development—the Idaho National Laboratory. We are also exploring the possible construction of a pilot Generation IV nuclear plant at our new lab that will demonstrate highly efficient electricity production and pave the way to realize the President's vision of a future hydrogen economy.

The Department's FY 2005 request for the nuclear energy program proposes a $410 million investment in nuclear research, development and infrastructure for the Nation's future that is designed to continue this progress. This budget request moves forward the Department's commitment to support the President's priorities to enhance the Nation's energy independence and security while enabling significant improvements in environmental quality. Our request supports development of new nuclear generation technologies and advanced energy products that provide significant improvements in sustainability, economics, safety and reliability, and proliferation and terrorism resistance.

We are committed to efficiently managing the funds we are given. We have abandoned outdated paradigms to integrate the Idaho Operations Office with our headquarters organization, enabling us to manage our responsibilities in the field to achieve greater quality and efficiency than would otherwise be possible. We are enhancing our expertise in critical areas such as project management through training and certification of existing staff and the acquisition of experienced, proven managers. We continue to implement the President's Management Agenda (PMA) by further integrating budget and performance, improving Program Assessment Rating Tool (PART) scores for our research and development programs, and linking major program goals in the performance plans for our Senior Executives and technical staff. These improvements are challenging and time-consuming, but we feel they must be done to assure our program's ability to make the best use of the taxpayer dollars.

While we have made great progress in all these areas, much remains to be done. Our FY 2005 request moves us in the right direction and I will now provide you a full report of our activities and explain the President's request for nuclear energy in detail.

GENERATION IV NUCLEAR ENERGY SYSTEMS

Our Generation IV effort continues to make significant progress. Since the Generation IV International Forum and the Nuclear Energy Research Advisory Committee (NERAC) issued their joint report, *A Technology Roadmap for Generation IV Nuclear Energy Systems,* the members of the Forum have expanded to include Switzerland and the European Union. The now eleven members (Argentina, Brazil, Canada, the European Union, France, Japan, the Republic of Korea, the Republic of South Africa, Switzerland, the United Kingdom and the United States) have organized into interest groups associated with each of the six selected Generation IV systems and are negotiating international legal agreements to enable advanced nuclear research to be conducted on a multilateral basis.

We hope to complete these negotiations later this year and move forward with these countries to develop advanced reactor technologies for commercial deployment in the 2015 to 2030 timeframe. Generation IV concepts offer significant improvements in sustainability, proliferation resistance, physical protection, safety and economics. These advanced systems will not only be safe, economic and secure, but will also include energy conversion systems that produce valuable commodities such as hydrogen, desalinated water and process heat. These features make Generation IV reactors ideal for meeting the President's energy and environmental objectives.

As indicated in our recent report to Congress on our implementation strategy for the Generation IV program, while the Department is involved in research on several reactor concepts, our efforts and this budget proposal place priority on development of the Next Generation Nuclear Plant (NGNP). The NGNP is based on the union of the Very-High-Temperature Reactor concept in the Generation IV Roadmap with advanced electricity and hydrogen production technologies. We are exploring the potential of an international, public-private project to build and operate a pilot NGNP at the Department's Idaho site. While the Department has not made a decision to proceed with this effort, such a project could validate the potential of this technology to contribute to meeting to goals of the President's Hydrogen Fuel Initiative. If suc-

cessful, this technology could produce hydrogen at a cost that is competitive with gasoline and electricity and with advanced natural gas-fired systems.

The Idaho National Laboratory and several other labs will also explore a range of other Generation IV concepts principally the Supercritical Water-Cooled Reactor, the Gas-Cooled Fast Reactor and the Lead-Cooled Fast Reactor. Our efforts will focus on establishing technical and economic viability, and developing core and fuel designs, and advanced materials for these concepts. We are also working with our colleagues in the Office of Science to assemble a joint Future Energy Advanced Materials Initiative aimed at the development of new materials for advanced fission and fusion energy systems. The FY 2005 request enables progress on this broad front. With your support, and the leveraging of our resources with those of our international partners, we expect to make continued progress toward developing world-changing technologies.

NUCLEAR HYDROGEN INITIATIVE

Hydrogen offers significant promise as a future energy technology, particularly for the transportation sector. The use of hydrogen in transportation will reduce U.S. dependence on foreign sources of petroleum, enhancing national security. Significant progress in hydrogen combustion engines and fuel cells is making transportation using hydrogen a reality. Today, through electrolysis, we can convert water to hydrogen using electricity. We believe that for the future, Very-High-Temperature Reactors coupled with thermochemical or high temperature electrolytic water splitting processes offer a more efficient technology for production of large quantities of hydrogen without release of greenhouse gases. The goal of the Nuclear Hydrogen Initiative is to develop economic, commercial-scale production of hydrogen using nuclear energy.

With funding of $9 million in FY 2005, the Nuclear Hydrogen Initiative will progress toward the development and demonstration of closed, sulfur-based cycles, such as the sulfur-iodine process. These processes have been demonstrated on a bench scale at somewhat lower temperatures and pressures than would be required for economic hydrogen production, but they show considerable promise, especially when they are considered for mating to Very-High-Temperature Reactor systems. We will also explore high temperature electrolysis, which uses electricity to split high temperature steam into hydrogen and oxygen, similar to a fuel cell operating in reverse (specifically a solid-oxide fuel cell, SOFC). High temperature electrolysis requires much less fundamental R&D, but the ability of the process to scale economically must be demonstrated.

Finally, a major effort will be pursued in FY 2005 to explore materials for hydrogen production processes which must endure high temperatures and very corrosive environments while maintaining structural integrity at low costs. Included in this effort will be our work to explore new membranes that can increase the efficiencies of the hydrogen production processes.

ADVANCED FUEL CYCLE INITIATIVE

Of the issues affecting future expansion of nuclear energy in the U.S. and worldwide, none is more important or more difficult than that of dealing effectively with spent nuclear fuel. After a long and difficult process, the U.S. is moving forward with a geologic repository, and the Department is on schedule to submit a license application to the Nuclear Regulatory Commission by the end of 2004.

Research on improving ways to treat and utilize materials from spent nuclear fuel will allow the Department to optimize the first repository, and delay—and perhaps even eliminate—the need for future repositories. The Advanced Fuel Cycle Initiative, with an investment of $46 million for FY 2005, will continue the progress made in the development of proliferation-resistant treatment and transmutation technologies that can reduce both the volume and toxicity of spent nuclear fuel. These technologies would support both national security and energy independence by reducing inventories of commercially-generated plutonium while recovering residual energy value from spent nuclear fuel. If successful, these same technologies offer benefits of enhancing national security by reducing inventories of commercially-generated plutonium and enhancing energy independence by recovering the energy value contained in spent nuclear fuel.

The program has already enjoyed considerable success. We have proven the ability of our UREX technology to separate uranium from spent fuel at a very high level of purity and also shown that a derivative, UREX+, can separate a combined mixture of plutonium and neptunium that can serve as the basis for a proliferation-resistant fuel for light water reactors.

The Department's research efforts are leading to the demonstration of proliferation-resistant fuel treatment technologies to reduce the volume and radioactivity of

high level waste, and the development of advanced fuels that would enable consumption of plutonium using existing light water reactors or advanced reactors. We have tested proliferation-resistant nitride and metal transmutation fuels in the Advanced Test Reactor and are currently testing mixed-oxide fuels such as would be derived from the UREX+ process.

For the Advanced Fuel Cycle Initiative to be successful, advanced fuel treatment and transmutation research and development must be integrated with the development of Generation IV nuclear energy systems, particularly with those reactor technologies that can produce very high energy neutrons that would be needed to transmute a wide variety of toxic radioactive species. We have organized our national labs, universities, and international collaborations in a manner that will enable this work to proceed in a coordinated manner.

NUCLEAR POWER 2010

The President's Budget supports continuation of Nuclear Power 2010 in FY 2005 to demonstrate, in cost-shared cooperation with industry, key regulatory processes associated with licensing and building new nuclear plants in the U.S. by the end of the decade. The requested funds of $10 million would support the activities associated with achieving NRC approval of early site permits and the development of Combined Construction and Operating License applications.

It is also critical that the Department identify the business conditions under which power generation companies would add new nuclear capacity and determine appropriate strategies to enhance such investment. In FY 2005, the Department will continue to evaluate and develop strategies to mitigate specific financial risks associated with the deployment of new nuclear power plants.

In December, the Department issued a solicitation inviting proposals from teams led by power generation companies to initiate New Nuclear Plant Licensing Demonstration Projects. Under these cost-shared projects, power companies will conduct studies, analyses, and other activities necessary to select an advanced reactor technology and prepare a site-specific, technology-specific Combined Operating License application. These projects will provide for NRC design certification and other activities to license a standardized nuclear power plant design. The Department expects to award at least one project in this fiscal year. The focus of activities in FY 2005 for these projects will be on development of the Combined Operating License application.

UNIVERSITY REACTOR FUEL ASSISTANCE AND SUPPORT

The Department is very pleased with the progress we have made in reversing the decline in nuclear engineering in the United States. With significant support and encouragement from this body and your colleagues in the House of Representatives, we have played a large role in completely reversing the decline in undergraduate enrollments in this area of study that began in 1993 and continued through 1998. In 1998, the U.S. saw only around 500 students enroll as nuclear engineers—down from almost 1,500 in 1992. After several years of focused effort, the United States now has over 1,300 students studying nuclear engineering. That number is set to increase further, as strong programs—such as at Purdue and Texas A&M—continue to grow and we see new programs start at schools such as South Carolina State University, the University of South Carolina, and the University of Nevada-Las Vegas.

The growth of nuclear energy in the United States is dependent on the preservation of the education and training infrastructure at universities. The research conducted using these reactors is critical to many national priorities. Currently, there are 27 operating university research reactors at 26 campuses in 20 states. These reactors are providing support for research in such diverse areas as medical isotopes, human health, life sciences, environmental protection, advanced materials, lasers, energy conversion and food irradiation.

The most exciting development in University Reactor Infrastructure and Education Assistance is the Innovations in Nuclear Infrastructure and Education (INIE) Program established in FY 2002. In FY 2003, two additional university consortia were awarded, bringing the total to six INIE grants, providing support to 24 universities in 19 states across the Nation. The consortia have demonstrated remarkable collaborative efforts and strong formation of strategic partnerships between universities, national laboratories, and industry. These partnerships have resulted in increased use of the university nuclear reactor research and training facilities, upgrading of facilities, increased support for students, and additional research opportunities for students, faculty and other interested researchers. We are very pleased that the President's Budget includes $21 million for the University Reactor Infrastructure and Education Assistance program for fellowships, scholarships, nuclear

engineering research, and for critical support to university research reactors, all of which will help address this shortage of well-trained nuclear scientists.

We have modified the structure of this program for FY 2005. I am pleased to report that the President's request includes a small but important element to provide scholarships and graduate fellowships to students studying the vital and too-often overlooked discipline of health physics. The Department is concerned that the Nation may soon not have the trained health physicists who are needed to assure the safety of all nuclear and radiological activities. With this budget, we begin building a program to reverse the negative trends in this field as we have already done in nuclear engineering. In another change, we will transfer responsibility for the shipment of spent research reactor fuel to the Office of Civilian Radioactive Waste Management, which is to become the Department's central expertise in the management of spent fuel.

One final note in this regard, Madam Chairman. I am sure that you have noticed that no funding is requested for the Nuclear Energy Research Initiative (NERI) in FY 2005. While this program has successfully spurred U.S. nuclear energy R&D, we believe that the time has now come to integrate the program into our main-stream R&D programs. We will continue to make peer-reviewed NERI awards to university-based researchers who work in areas relevant to our Generation IV, Nuclear Hydrogen, and Advanced Fuel Cycle Initiative programs. With this step, we will engage NERI researchers at universities in the exciting, first-class research we are pursuing in cooperation with countries all over the world.

RADIOLOGICAL FACILITIES MANAGEMENT

This budget request also includes $69.1 million to maintain critical research, isotope and space and national security power systems facilities at Oak Ridge National Laboratory, Los Alamos National Laboratory, Sandia National Laboratory, and Brookhaven National Laboratory in a safe, secure, and cost effective manner to support national priorities.

The FY 2005 budget request also includes $20.6 million to continue baseline operations and begin construction of the Uranium-233 project at Oak Ridge National Laboratory. This project is aimed at stabilizing materials left over from the Cold War to address a Defense Nuclear Facilities Safety Board recommendation, while extracting isotopes from the uranium that are needed for very promising medical research.

INL—DOE'S COMMAND CENTER FOR NUCLEAR R&D

This budget supports the Secretary's realignment of the mission of the Idaho National Engineering and Environmental Laboratory to focus the future of the site on nuclear research and development. The Department is in the process of establishing the Idaho National Laboratory, which will combine the resources of the INEEL and the Argonne-West site. As the Department's leading center of nuclear research and development, a core mission of this laboratory is advanced nuclear reactor and fuel cycle technologies, including the development of space nuclear power and propulsion technologies. The new Idaho National Laboratory will play a vital role in the research and development of enabling technologies for the Next Generation Nuclear Plant, which will support the Department's long-term vision of a zero-emissions future free of reliance on imported energy.

The Department issued a request for proposals in February to find a management team to reduce costs and build expertise at the INL. The Department's nuclear energy program involves the collective talents of universities, the private sector, international partners and many of our other national laboratories—Argonne, Los Alamos, Sandia and Oak Ridge among them. However, the rebuilding of the Department's nuclear power research and development program will be centered at INL. While environmental cleanup remains an important focus at the Idaho site, real progress is being made that will aid in the expansion of nuclear research and development.

Developing a central research laboratory is a major step forward for the nuclear energy program. We will join the other key energy programs at the Department by having a central, dedicated research site at which we can centralize our infrastructure investments and build the expertise needed to accomplish our program goals. A central lab also helps us minimize the shipment of nuclear materials across the country and allows us to bring our nuclear materials together in a single, secure location. We also expect that our new lab will become a major player in the education of the next generation of nuclear energy technologists that this Nation will need to assure our energy security in the future.

CONCLUSION

This concludes my prepared statement. Your leadership and guidance has been essential to the progress the program has achieved thus far and your support is needed as we engage the tasks ahead.

I would be pleased to answer any questions you may have.

BIOGRAPHY FOR WILLIAM D. MAGWOOD, IV

William D. Magwood, IV is the Director of the Office of Nuclear Energy, Science and Technology in the U.S. Department of Energy. He was appointed to this position on November 8, 1998.

As the Director of Nuclear Energy, Science and Technology, Mr. Magwood is the senior nuclear technology official in the United States Government and the senior manager for all of the Office's programs. Under Mr. Magwood's leadership, the Office of Nuclear Energy, Science and Technology has led the Nation in a new consideration of nuclear technology as a means to address difficult problems facing the Nation in the 21st Century.

Mr. Magwood is leading the Department's *Nuclear Power 2010* initiative, aimed at building new nuclear plants in the U.S. by 2010 as a key to long-term energy security. He is also leading the *Generation IV* initiative, working closely with the *Generation ITS International Forum*—an international collective of 10 leading nations and the European Union's Euratom—dedicated to development of next generation advanced nuclear energy technologies.

Under the direction of Mr. Magwood, the office has reasserted a leading role for the United States in the international discussion regarding the future use of nuclear power technology to generate secure supplies of energy without emitting air pollutants that can damage the environment, both regionally and globally. His contributions to the advancement of nuclear technology have been recognized internationally; in 2003, he was elected Chairman of both the Generation IV International Forum and the Paris-based OECD Steering Committee on Nuclear Energy.

Prior to assuming his current position, Mr. Magwood served as the Associate Director for Technology and Program Planning in the Office of Nuclear Energy, Science and Technology for four years. He also served as the Executive Secretary of the interagency Highly Enriched Uranium Oversight Committee.

From 1984–1994, Mr. Magwood held technology management positions with two energy-related organizations. He managed electric utility research and nuclear policy programs at the Edison Electric Institute, Washington, DC; and he was a scientist at Westinghouse Electric Corporation, Pittsburgh, Pennsylvania, where he analyzed radiological and hazardous waste disposal, treatment, and handling systems, and provided technical support to nuclear fuel marketing efforts.

Mr. Magwood holds a B.S. degree in Physics, and a B.A. degree in English from Carnegie-Mellon University. He also holds an M.F.A. degree from the University of Pittsburgh.

Chairman BIGGERT. Thank you very much, Mr. Magwood.

And now, Mr. Glotfelty.

STATEMENT OF MR. JAMES W. GLOTFELTY, DIRECTOR OF THE OFFICE OF ELECTRIC TRANSMISSION AND DISTRIBUTION, U.S. DEPARTMENT OF ENERGY

Mr. GLOTFELTY. Thank you. Thank you, Madame Chairman, Members of the Subcommittee. I appreciate the opportunity to testify today on our research and development priorities for fiscal year 2005. My name is Jimmy Glotfelty. I am Director of the Office of Electric Transmission and Distribution. The mission of this newly created office is to lead a national and international effort to modernize and expand America's electric delivery system to one that is more reliable and robust and can help ensure economic and national security.

Neither government nor industry alone can provide the Nation's electric infrastructure needs. Our National Electric Delivery Technology Roadmap provides a framework for all of the electric industry stakeholders to work together to achieve a common goal. The

call for grid modernization is coming from all levels of leadership. Many in Congress, including this subcommittee, have called for it. And in the President's 2004 State of the Union Address, he asked Congress for energy legislation necessary to modernize our electric delivery system. In fiscal year 2005, the Administration has requested $90.9 million for the Transmission and Distribution Office, a 12.5 percent increase over the fiscal year 2004 appropriation. This effort includes research, development, demonstration, technology transfer, and education and outreach activities and partnership with businesses, utilities, states, and many other stakeholders.

On September 25, 2003, I testified before this subcommittee on the role of new technologies in developing a more robust electric system. I identified a portfolio of technologies that have the capabilities to enhance the reliability and efficiency of the electric grid. They include: advanced conductors and new materials, high temperature superconductors, electricity storage, communications, controls, and information technologies, advanced power electronics, and distributed energy technologies. Our priorities in fiscal year 2005 build upon those that I highlighted last year.

The research and development program with the Office of Electric Transmission and Distribution consists of four main program activities. They are continuing from 2004: High Temperature Superconductivity, Transmission Reliability, Electric Distribution Transformation, and Energy Storage. In 2005, these will be supplemented by two new research and development initiatives: GridWise and GridWorks.

The 2005 High Temperature Superconductivity budget request of $45 million reflects our drive to develop second-generation wire usable in cables, generators, transformers, and motors, equipment that crosscuts the electric power system value chain. Budgets for other program activities, such as transmission reliability and energy storage, also reflect increases in 2005.

The appearance of reduction in funding is due to the omitted—omitting of Congressionally directed activities from the 2005 request, which amounted to $7.2 million in transmission reliability and $6.8 million for energy storage. The biggest challenge for these programs is consistent funding, and the threat that Congressionally directed activities will reduce the program directed funding below key threshold levels. In fact, I might note that our Transmission Reliability program was zeroed out three times in the 1990's, and that has set us back tremendously in this decade to ensuring a more reliable transmission system.

The 2005 budget request also includes $10.5 million for our GridWorks and GridWise Initiatives, which are aimed at reducing the likelihood and impact of blackouts. The GridWise and GridWorks Initiatives evolved from our vision and roadmap process, which included stakeholders from—over 300 stakeholders from the industry, academia, state, and local governments. There was an identified need for a portfolio of technologies that crosscut the transmission and distribution system. There was a recognition that efforts to develop distributed intelligence, smart controls, and power electronics needed to be accelerated and expanded.

The GridWise program comprises the intelligence, or brains, behind the modern electric grid. GridWise is focused on communication and information technologies. GridWorks fosters the development of many of the technologies that I highlighted last September. It uses DOE's facilities at our national laboratories, as well as partners in the industry, to accelerate the development and testing of advanced conductors and other tools that will make our system more reliable. GridWorks also pursues advanced power electronic breakthroughs to provide faster means of limiting transmission problems before they propagate throughout the electric system.

I would like to conclude by talking about budget performance integration within OETD. The President's Management Agenda identifies the need to tie research and development investment to performance and well-defined practical outcomes. Last year, we completed a PART evaluation of the High Temperature Superconductivity program. This exercise revealed that this program is well-managed, uses near-term and long-term tracking systems to measure progress, uses independent peer reviews, spend plans, and site visits to ensure quality program management. However, PART also concluded that the HTS program has demonstrated only a small extent of results in achieving its long-term performance goals.

We are addressing this issue and look forward to working with you all to address this issue as we move forward. We commit to devote more time and resources to ensure we achieve our long-term performance goals.

I thank you for this opportunity to testify today. I look forward to working together with you to make a more reliable and efficient electricity system, and I would be happy to answer any questions.

Thank you.

[The prepared statement of Mr. Glotfelty follows:]

PREPARED STATEMENT OF JIMMY GLOTFELTY

THE OFFICE OF ELECTRIC TRANSMISSION AND DISTRIBUTION OVERVIEW

Chairman Biggert and Members of the Subcommittee, thank you for the opportunity to testify today on the science and technology priorities for Fiscal Year 2005 within the Office of Electric Transmission and Distribution.

The mission of the newly created Office of Electric Transmission and Distribution (OETD) is to lead a national effort to modernize and expand America's electricity delivery system to ensure a more reliable and robust electricity supply, as well as economic and national security. This is vital to the Department's strategic goal to protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy.

The August 14, 2003 blackout demonstrated the vulnerability of the electric grid and thus its strategic importance to our nation. President George Bush stated in September 2003: ". . .it's clear that the power grid needs an overhaul. It needs to be modernized. As we go into an exciting new period of American history, we want the most modern electricity grid for our people. . .we need more investment; we need research and development.. . ."

The Administration has requested $90.9 million for OETD in FY 2005, a 12.5 percent increase over the FY 2004 comparable appropriation. This effort includes research, development, demonstration, technology transfer, and education and outreach activities in partnership with industry, businesses, utilities, states, other federal programs and agencies, universities, national laboratories, and other stakeholders.

On September 25, 2003, I testified before this subcommittee on the role of new technologies in developing a more robust electric system. I identified a portfolio of technologies that have the capabilities to enhance the reliability and efficiency of the electric grid. They include Advanced Conductors and New Materials (a compo-

nent of the new GridWorks initiative); High Temperature Superconductors; Electricity Storage; Communications, Controls, and Information Technologies (emphasis of the GridWise initiative); Advanced Power Electronics (supported by both the Energy Storage Program Activity and the GridWorks Initiative); and Distributed Energy Technologies. Our priorities in Fiscal Year 2005 build upon those that I had highlighted in September.

Neither government nor industry alone can satisfy the Nation's electric infrastructure needs. The *National Delivery Technologies Roadmap* provides a framework for all of the electric industry stakeholders to work together to achieve common aims. The call for grid modernization is coming from all levels of leadership. The President's 2004 State of the Union Address asking Congress to "modernize our electricity system" reiterated the Administration's objectives first outlined in the *National Energy Policy [May 2001]* and reinforced, in more detail, in the *National Transmission Grid Study (NTGS) [May 2002].*

Modernizing the grid will involve time, resources, and unprecedented levels of cooperation. The Nation's aging electric infrastructure, and the increasing requirements placed on it, have contributed to market inefficiencies and electricity congestion in several regions. These conditions could lead to more outages, more power quality disturbances, higher prices, and the less efficient use of resources. We must act now or risk even greater problems in the future.

RESEARCH AND DEVELOPMENT

The Research and Development (R&D) Program within OETD, which will contribute to the modernization of the electricity system, consists of four main Program Activities that are continuing from FY 2004: High Temperature Superconductivity; Transmission Reliability; Electric Distribution Transformation; and Energy Storage. In FY 2005, these will be supplemented by the new GridWorks R&D initiative and the GridWise Initiative, and the Electricity Restructuring Program Activity.

The Transmission Reliability R&D Program Activity supports modernization of the Nation's transmission infrastructure through technologies that provide enhanced grid reliability and efficient electricity markets under competition. In FY 2005, the Transmission Reliability Program is focused on developing real-time monitoring and control software tools and system operating models for grid operators, and market design research, including demand response integration, to support restructured markets development.

The Electric Distribution R&D Program Activity supports R&D that will enable "plug-and-play" of distributed resources, including load, through the development and testing of advanced interconnection technologies and standards. This "plug-and-play" technology will allow the full integration of distributed resources into distribution operations, and lead to increased asset utilization and enhanced system reliability for the entire national electrical system.

The Energy Storage R&D Program Activity includes research in advanced energy storage devices for applications ranging from power quality for digital facilities to voltage support for transmission lines. In FY 2005, the Energy Storage Program will accelerate development of advanced storage technologies to mitigate grid congestion and increase grid stability, reducing the incidence of power quality disturbances.

Finally, the Electricity Restructuring Program Activity provides technical assistance and analytical support to States and regions for policies, market mechanisms, and activities that facilitate competitive, reliable, environmentally sensitive, and customer-friendly wholesale and retail electric markets. In FY 2005, the Electricity Restructuring Program will use education and outreach to help States, regional electric grid operators, and federal agencies develop policies, market mechanisms, and programs that facilitate the effort to modernize and expand America's electric grid to ensure a more reliable and robust electric supply. Also to be undertaken is analysis and implementation of policy-related recommendations that would improve reliability and enhance the electric transmission system contained in the NTGS, identified in the August 2003 Blackout Investigation Final Report, or in pending energy legislation when enacted.

THE GRIDWISE AND GRIDWORKS INITIATIVES

OETD's FY 2005 budget request, reflecting the Administration's efforts to modernize and expand the electric grid, includes $10.5 million for the new GridWorks Initiative and the existing GridWise Initiative, which are aimed at reducing the likelihood and impact of reliability events, such as blackouts.

The GridWise and GridWorks Initiatives evolved from OETD's vision and roadmap process, documented in the *National Delivery Technologies Roadmap.* There was an identified need for a portfolio of technologies that crosscut the electric transmission and distribution system. Although continuing research in high temperature

superconducting materials and electric storage devices was considered critical, there was also recognition that efforts to develop distributed intelligence, smart controls, advanced conductors, and power electronics needed to be accelerated and expanded.

GridWise denotes a modernized electric infrastructure framework where open, but secure, communication and information technologies, and associated standards, are used throughout the electric grid to enhance reliability and robustness, promote economic efficiencies, and provide value and choices to electricity consumers. The GridWise program activity (software-centric) comprises the intelligence—or brains—behind a modern electric grid that incorporates GridWorks (hardware-centric) technology.

GridWorks is focused on advanced equipment applications, taking an integrated approach to the entire electric system. It bridges the gap between the laboratory prototypes of the base programs and the application needs of the electric industry. GridWorks uses the facilities at DOE's national laboratories to accelerate the development and testing of advanced conductors, which can increase much needed transmission line capacity. It complements GridWise's architectural software development by developing and demonstrating associated hardware, such as sensors. GridWorks pursues advanced power electronic breakthroughs to provide faster means of limiting transmission problems before they propagate through the electric system.

HIGH TEMPERATURE SUPERCONDUCTIVITY

OETD's FY 2005 High Temperature Superconductivity budget request of $45 million reflects a $10.9 million increase to develop second generation wire usable in cables, generators, transformers, and motors—equipment that crosscuts the entire electric power value chain.

High temperature superconductors are a good example of advanced materials that have the potential to revolutionize electric power delivery in America. The prospect of transmitting large amounts of power through compact underground corridors, with minimal electrical losses over long distances, could significantly enhance the overall energy efficiency and reliability of the electric system, while reducing fuel use, air emissions, and any physical footprint. Also, breakthroughs in basic science are rapidly applied in the area of high temperature superconductivity. For instance, benefits from nanoscience research are accelerating progress in superconductivity wire development.

BUDGET AND PERFORMANCE INTEGRATION

The President's Management Agenda identified the need to tie R&D investment to performance and well-defined practical outcomes. Evaluation of the High Temperature Superconductivity (HTS) R&D Program through application of the FY 2005 Program Assessment Rating Tool (PART), revealed that the program was well managed including use of near-term and long-term tracking systems to measure progress toward annual targets and long-term performance goals, use of independent peer reviews, spend plans, and site visit reviews. However, the HTS program has demonstrated only a "small extent" of results in achieving its long-term performance goal. OETD is addressing this finding by devoting more of its resources to its long-term performance goal: "by 2012, develop to the 100 percent operational capability level, wire and four types of HTS electric power prototypes with typically half the energy losses and half the size compared to conventional power equipment of the same rating."

The initiatives, GridWorks and GridWise, are aimed directly at improving reliability of the electricity delivery system by implementing advanced technologies and integrated-information management tools to overcome today's system limitations and to reduce the incidence of reliability events such as blackouts. As these initiatives move forward, DOE will ensure that the R&D investment is tied to performance and outcome. GridWorks and GridWise are essential elements in helping OETD to achieve its mission to lead the modernization effort of the Nation's electricity delivery system to ensure a more reliable and robust electricity supply, as well as economic and national security.

I thank you for the opportunity to testify today. I look forward to working together with you to make the reliable, efficient electricity system of the future a reality.

BIOGRAPHY FOR JIMMY GLOTFELTY

Jimmy Glotfelty is currently Director of the Office of Electric Transmission and Distribution at the Department of Energy. This new office was established by Secretary Spencer Abraham to focus attention on the policy and research and develop-

ment needs of the Transmission and Distribution systems. Prior to this position, he served as Senior Policy Advisor to Secretary Abraham. He is senior leader in the implementation of President Bush's National Energy Policy. He advises the Secretary on policy concerning electricity, transmission, interconnection, siting, and other areas within the DOE. He works closely with members of Congress and members of the FERC in order to ensure that we continue to move toward competitive wholesale electric markets. He is also responsible for the development of the national grid study to identify major bottlenecks across the U.S.

Prior to joining the DOE, Jimmy served as Director of Government and Regulatory Affairs for Calpine Corporation's Central Region. He actively pursued restructured markets and new wholesale and retail markets for new power generation companies in Texas, Louisiana, Alabama, and Mexico. In addition to government affairs, Jimmy oversaw Calpine's Central Region public affairs efforts.

From 1994 to 1998, Jimmy served as Director of General Government Policy and Senior Energy Advisor to Governor George W. Bush. He spearheaded many oil and gas initiatives, served as the Governor's office point staff member on both wholesale and retail electric restructuring in Texas, and oversaw the Texas State Energy Office. In addition to energy issues, Jimmy founded and managed the Governors High Technology Council, and was responsible for policy initiatives in the telecommunications, banking, housing, and pension arenas.

During his career, Jimmy was Legislative Director for Congressman San Johnson (R–TX) where he was responsible for all legislative operations as well as energy, banking, and telecommunications issues. Jimmy has also served as Finance Director for the Republican Party of Texas and as research director for the lobby and public affairs firm Dutko and Associates.

Jimmy resides in Arlington, VA with his wife, Molly, and their three sons.

DISCUSSION

Chairman BIGGERT. Thank you.

And some questions we do have for all of you, I am sure. Let me start and yield myself five minutes.

A question for Mr. Magwood. The Department has proposed reclassification of $750 million in funding for Yucca Mountain as offsetting collections, a change that requires statutory authorization. Could you describe the consequences to the budget if this change is not enacted? And then in addition, describe how any consequence—consequential delays in the construction of the Yucca Mountain waste disposal facility would impact the plans and priorities in the nuclear energy R&D program.

Mr. MAGWOOD. Madame Chairman, I would like to provide a very brief response to that. It—let me say that I think it is very important that we plan for success in this initiative. If we are successful in achieving an off-budget approach to funding the Yucca Mountain project, I think that puts the project on a much healthier financial footing for the future. I think it is the right thing to do. And I think that there is very wide support for taking it off budget. We recognize there are some challenges that face us as we go forward with implementing this approach, but we are all unified in the belief that success is possible, and we intend to go in that direction.

I will say, also, that the success of the Yucca Mountain project is absolutely essential to the future of nuclear power in this country. If we are not successful in keeping the schedule, industry and others will lose faith that we are able to meet our obligations as the government, and I think that would be very detrimental. So let us plan on success and let us be successful.

Chairman BIGGERT. So you would say that the chances that the change will be approved in election year are good?

Mr. MAGWOOD. We remain hopeful.

Chairman BIGGERT. Good. Okay. Then going further, Dr. Decker and Mr. Garman, and again, Mr. Magwood, and Mr. Glotfelty, our worst case scenario for your portion, then, of the energy and water appropriations bill is that the $750 million for Yucca Mountain that was to have come out of the nuclear waste fund, instead of coming out of your—instead of what might be coming out of your discretionary funding and if that cut were spread across your budgets according to their proportion of funding in the fiscal year 2005 request, then Science would be faced with a $60 million cut—$600 million cut, Renewable Energy with a $70 million cut, and Nuclear would see a $50 million cut, and the new Transmission and Distribution Office would be cut by $20 million. And if each of you were, of course, to make those cuts, where would you cut? Let us start with Dr. Decker, since you have the $600 million cut.

Dr. DECKER. Madame Chairman, that is something we certainly have not addressed, you know. In going through our budget preparation, we have prioritized all of the activities in our budget. I think we would have to go back to our prioritized list and start with the—obviously with the lowest priority activities on down. But I don't know exactly how we would propose to do that.

Chairman BIGGERT. Okay.

Mr. Garman.

Mr. GARMAN. I would offer that were that situation to unfold, Congress would make those allocations. The appropriators would have to spread those across our budgets. They might ask us for capability statements to help them make those choices, and then again, they might not. Sometimes they do; sometimes they don't.

Chairman BIGGERT. Well, you know appropriators. They are a different breed.

Mr. GARMAN. I wasn't going to go there, Madame Chair.

But you know, if that unfortunate circumstance came to pass, we would, obviously, try to work very closely with the appropriators to make sure that they understood how our priority-based budget was put together. I would suggest to them that the first place that they would dispense with, dare I say it, would be directed spending and earmarks, because in my program, we have well over $70 million in directed spending and earmarks. And that would be the first place I would urge them to look, but to what degree of success I would have would remain to be seen.

Chairman BIGGERT. All right. Thank you.

And Mr. Magwood, I know you are remaining positive, but just in case, as we hope everyone is.

Mr. MAGWOOD. In my job, Madame Chairman, being positive is a necessity.

I would—let me answer the question this way. I think that we have three layers of priority within the program. Assuring the nuclear safety of our facilities is the very highest priority, maintain their security is—it is part of that, so that would be, in my opinion, untouchable in any type of cut. My next highest priority would be protecting the students that we support in our program. We have a very ambitious and aggressive university program. I would recommend that that also be maintained. And then with what little is left, we would prioritize appropriately.

Chairman BIGGERT. Okay. Thank you.

And Mr. Glotfelty, the $20 million you——

Mr. GLOTFELTY. I think I would have to go down the same avenue that Mr. Garman did. Throughout the last two years, we have had $26 million worth of earmarks in each of the last two years. And I would suggest that our first opportunity would be to work with the Appropriations Committee to see if there are areas within those earmarks that we could cut.

Chairman BIGGERT. Thank you.

And I see that my time is up, so I will yield five minutes to Mr. Larson.

Mr. LARSON. Thank you, Madame Chairman.

I have two areas that I want to pursue. One deals with accessibility, and the other deals with some—deals with legislation and the practicality of legislation.

First, with regard to accessibility, demystify for me, if you will, for industry and manufacturers and universities, the accessibility to your various agencies. And I want to focus with Mr. Decker and Mr. Garman, but walk me through, if you will, the process, you know, the generation of an idea that needs research and development dollars, or research and development that needs to be incubated, or incubation that needs to be brought to the mezzanine level before it goes out and is actually marketed. It just seems to me—and both of you in your remarks, focus generally on these areas what do we need to do in terms of addressing my concern with regard to job creation in these areas and the leading role, I think, that DOE can play.

Dr. DECKER. Mr. Larson, as you know, the Office of Science supports, primarily, basic research. Our method of looking at new ideas usually is through unsolicited research proposals that come to us, which are then sent out for peer review, and a decision is made on the basis of the quality of the science and the relevance to the Department of Energy's missions. That is certainly one way, and a major way, in which new ideas are considered by the Office of Science.

But I would also say that there are other avenues into the DOE system through the laboratories. Often companies that wish to utilize the capabilities in the DOE national laboratories come in and sponsor work in those laboratories where they can get, you know, experts in various areas to work on their problems. And also, there is——

Mr. LARSON. You mentioned in your testimony the GTL program, et cetera.

Dr. DECKER. Yes.

Mr. LARSON. How does one go about accessing that?

Dr. DECKER. Again, through unsolicited proposals. Generally, we put out a broad area announcement that indicates the interests that we have in various research areas. We do that at the beginning of the year. And then industry, universities respond with proposals.

Mr. LARSON. Is there a lab anywhere in the country that is specifically focused on hydrogen and the, how shall I phrase this, harnessing of hydrogen as a potential energy source, or are we spread over a variety of areas?

Dr. DECKER. There is certainly work going on in a number of DOE laboratories, but I would say at Dave Garman's laboratory, the National Renewable Energy Laboratory out in Colorado, there is certainly a strong focus on hydrogen, but Dave should talk to that.

Mr. GARMAN. With that lead-in, our systems integration—all the systems work related to hydrogen, all of the disparate pieces of a very complex change in infrastructure that has to occur if as we move toward the hydrogen energy economy—is something that we do manage and are managing, pursuant to a National Academy of Sciences National Research Council report, at the National Renewable Energy Lab. We have that system integration effort underway.

But let me respond to your first question, and it is a good contrast between the Office of Science and some of the other applied sciences offices. Pursuant to the President's Management Agenda where one of the initiatives is to make government more accessible to people, we have, through, we call it E-Gov, the E-Gov program, we are doing a much better job, I think, of putting our funding solicitations, competitive solicitations, on the Internet so that they are more accessible to anybody with a computer and access to the Internet. We like to publicize. We say to the world, "We are interested in doing work in, say, reducing platinum loads on membranes in fuel cells. What can you bring to the table?" And we put that on the Internet. We do competitive solicitations, and we help generate ideas, and then we go through a process very much like that that Dr. Decker described, where we evaluate those, rank those, and we form partnerships with the private sector. I would say that in the context of the FreedomCar program, which is a public/private partnership, yes, some money goes to national labs, some money goes to universities, but a good amount of money goes to those Tier One and Tier Two automotive supply companies. Some of them are quite small. Some of them have an innovative idea that they want to, you know, push up to the big leagues for incorporation in the next generation of vehicles. And they get a good amount of our funding in that area.

Mr. LARSON. Well, keeping that in mind and seeing that the—my red light is going on, but in the next round, which I am sure there will be, the—if you would keep—my second question was going to be, from a practicality standpoint, it just seems to me that we are never going to be able to tackle this problem of harnessing hydrogen unless we put out there for the public the opportunity to access and then practically put it to work. By that I mean by the Federal Government stepping in and saying, with all due respect to the FreedomCar, I think there is probably a likelihood that we will be able to do this on buses in a more dynamic way before automobiles. But also, in terms of providing municipalities and states, all who have to transport kids back and forth to school on buses, who have to heat and cool school buildings and office buildings, that if we are going to look at alternative energies, and specifically, if we are going to focus on the harnessing of hydrogen, if you could respond, in the next round, to how an incentive program—how you might envision an incentive program like that that would provide those planning agencies who are looking at fleets of automobiles,

buses, and buildings, what might be helpful in the form of legislation.

Chairman BIGGERT. Thank you.

And the gentleman from Michigan, Dr. Ehlers, is recognized.

Mr. EHLERS. Thank you.

Careful, even a physicist can make a mistake, but this audience might appreciate that.

Mr. GARMAN. I have been waiting for years to see that.

Mr. EHLERS. Yeah.

The—Mr. Garman, first of all, I just want to continue a discussion that we had, I believe it was exactly three weeks ago, where I expressed to—you started out by making the comment that you were going to do all of these wonderful things without "goring the ox" of Energy Efficiency R&D, and I questioned that, and you gave me a number of figures of what was increasing. But I have since looked at that, and it looks to me like the EERE R&D budget, even though your overall budget has gone up 1.4 percent, the EERE R&D budget is going down 4.7 percent. And if you take off the Hydrogen FreedomCar, you are going down 9.9 percent. And I just wanted to get that on the record.

Mr. GARMAN. Well, may I, Mr. Ehlers? I believe I was specifically asked about the renewable energy program, and I think a review of the record will point that out. And several Members were saying, "You are cutting renewable energy to pay for hydrogen." And I believe I responded with those numbers, pointing out that that was not the case. I did, in my oral testimony, concede the fact that overall R&D, on both sides of the funding fence, between the Energy Conservation Appropriations bill and the Energy and Water Development Appropriations bill, from which EERE draws its funding, is down. And I do concede that point. I believe the question I was asked at that hearing three weeks ago pertained to renewable energy funding.

But overall, you are correct; for renewable energy, which is what I believe I was asked about at that hearing, we did not sacrifice renewable energy funding to pay for hydrogen.

Mr. EHLERS. Well, I want to make it clear, we are here to help you. We think the budget is too low, and we would like to boost it. I am not sure we will be able to this year, but I just wanted to make clear—make certain that everyone understands just what the cuts are and where the cuts are and the damage that is being done so that we can help try to improve that situation.

The——

Mr. GARMAN. Thank you.

Mr. EHLERS. I—in connection with that, Mr. Decker—Dr. Decker, since you have your nameplate there, I just wanted to comment and ask a question about RIA, Rare Isotope Accelerator, something I am very interested in. In fact, the State of Michigan is very interested in it. And I—a number of others are. Where is that, at this point? How far—what is the next step? What do you see happening soon? And what sorts of funds are required this year? We may seek to supplement those in the legislature, but I would just appreciate your comments on that.

Dr. DECKER. Mr. Ehlers, where we are with that facility at the present time is that the Department has made the critical decision

zero, and that is a mission needs statement by the Department. The Department has decided that yes, it needs this facility. It has not made the decision yet to move forward with the construction. The acquisition executive for the RIA project is the Deputy Secretary. Because of the size of this project, it goes up to his level. We have requested $4 million in R&D funding in the fiscal year 2005 budget. We believe that that amount of funding will allow us to continue the R&D that is necessary and perhaps a little pre-conceptual design activity that will be necessary for the next step, which is to develop a conceptual design for this facility.

Mr. EHLERS. All right. We will continue to pursue that. And as I say, we have a great interest. We will seek to obtain greater funding, if we can.

Mr. Garman, just back to you a minute. I just wanted to point out for the record, again, assuming the budget proposal numbers follow, Fossil Energy R&D has increased 35 percent since fiscal year 2001, Renewable Energy R&D, including much of the hydrogen fuel, by 20 percent since fiscal year 2001, Nuclear Energy up 8.3 percent, but Energy Efficiency R&D will decline by 12 percent. Now is it—do you——

Mr. GARMAN. That sounds correct.

Mr. EHLERS. And is that the Administration policy that energy efficiency research is the least important of these program areas?

Mr. GARMAN. No, sir, and again, I touched on this in the oral testimony. That is a tradeoff, and a deliberate tradeoff that has been made to fund more money for the Low-Income Weatherization Program.

Mr. EHLERS. And I have no objection to low-income weatherization, although I do have some questions about the operation of the program, but we can't eat our seed corn. We may get more out of the energy efficiency R&D. And I—both through conservation and through greater efficiency of equipment, particularly lighting and what Oak Ridge is doing in lighting. That, I think, holds a great deal of promise, and we ought to pursue that very diligently. But I just want to put my plug in for that.

Mr. Decker—Dr. Decker, again, just one other question. I heard, through the rumor mill, and I want to see if it is correct or not, that Mr. Orbach was not included in the high-level budget discussions. Is—he, of course, did not tell me that. He is very—totally proper, and I don't—I want to make clear that he has not discussed this with me at all, but I want to find out if that is true. Is it customary for the Director of the Office of Science to be part of the budget discussion? It seems to me that that is a very important area of research and that that person should be there when the final budget decisions are being made.

Dr. DECKER. Mr. Ehlers, certainly Dr. Orbach was involved in budget discussions as the budget was formulated. At some point in the process, I think it is always true that there is a very high level discussion, and certainly, the Office of Science, or I would say, other equivalent offices are not involved in some of the final budget discussions. I think that is pretty typical.

Mr. EHLERS. But you recognize that is a very esoteric field, and I suspect most of the people in the room did not understand the issues that Mr. Orbach is heading. Is that a safe assumption?

Dr. DECKER. Well, if it was—if it were a detailed discussion on some of our elements of our program, I would agree with you. If it was sort of the—you know, the higher level discussions, which I think occur more at the end of the process, I am not so sure that that is a problem.

Mr. EHLERS. Okay. I appreciate your opinion, but I think it is a problem, and I would hope that there be a mechanism for—particularly in fields that are esoteric and very important that his counsel be available.

Thank you, Madame Chair.

Chairman BIGGERT. I thank you, Dr. Ehlers. And I am sure you realize that the Members from Illinois are very interested in the RIA project, also.

Mr. EHLERS. I am aware of that, but I am very puzzled by that.

Chairman BIGGERT. I don't think you will have any reason to be.

And next, we will call on the gentlewoman from California, Ms. Woolsey.

Ms. WOOLSEY. Thank you, Madame Chairman.

Mr. Garman, it appears that the Administration's major focus is on hydrogen and fuel cells, but we know that any real results will be decades away. I mean, it is important we do this, but we have got a long way to go. And in the meantime, shouldn't we be putting more of our efforts into renewable energies and solar, wind, hybrid vehicles that are proven efficient and effective? I mean, can't we do both at the same time, and if not, why not?

Mr. GARMAN. Thank you for that question.

We are seeking more money for hybrid vehicles and energy storage on vehicles, because we think that that is a very important area. It will pay benefits in the shorter-term with hybrid vehicles, since most of these same components, power electronics, electric motors, energy storage, will also be employed in the fuel cell vehicles. So it is a win-win in the sense that we can invest and we have sought, for two years running, I believe, increases in the vehicle technologies applicable to hybrid vehicles and those fuel-efficient vehicles.

We have sought less funding in vehicle technologies in combustion engines and fuels, diesel, if you will. We have sought less funding for those activities, which also could provide an efficiency boost in the interim, so I will concede that point.

In terms of wind, we have a small and modest increase in that. This is a very successful technology that is beginning to compete with natural gas fired generation in many parts of the country, and we are happy to see that. It is a great success. Basically, there is flat funding for solar—it is actually up a little when you take out the earmarks. Geothermal is up a little. Biomass is down, but again, when you take out the earmarks, it is up. I think the important thing for the Committee to appreciate, and this committee does appreciate it, is the fact that we are now, I think all of us at this table, becoming more and more disciplined at laying out our program plans so that Congress can see, in our budget submission, what it is that we expect to achieve, when we expect to achieve it, and you can judge, and we can judge, the progress we are making against those goals.

Ms. WOOLSEY. Well, thank you very much, because there is—our goal is to be energy efficient, and—for our national security and have our environment cleaner, and that is going to get us there. And the sooner, the better.

Dr. Decker, I would like to ask you if you think we have an adequate supply of research and development engineers, and Mr. Garman, you may want to answer this, too, available as students in our universities, as educators, and—so that we can meet our future needs. I mean, this is national security getting there.

Dr. DECKER. Ms. Woolsey, I am not sure that I am—I wouldn't claim to be an expert on that topic. I can give you my impressions.

Ms. WOOLSEY. Quickly.

Dr. DECKER. I think the Department does have a problem with regard to U.S. citizens—enough U.S. citizens with degrees and training in science and engineering. That continues to be a significant issue. One of the things that I heard recently, I was up at MIT a couple of weeks ago, and I was surprised to learn that the number of students in physics has actually increased for the first time. There was a bit—a decline in physics for a number of years, and apparently that has turned around, not just at MIT, but, I was told, nationwide. So that is an encouraging sign. But it continues to be an issue, I think, particularly for organizations like ours that have national security work.

Ms. WOOLSEY. Mr. Garman, do you want to add anything to that?

Mr. GARMAN. I do. And this is an area that we feel pretty strongly about. We have some very modest efforts, and one that comes to mind is one that is underway at this very moment. We have a project we call Future Truck where we go to 15 colleges and universities, selected out of 100 that apply, and in partnership with a major automobile company, give engineering students, young, budding, engineering students, a vehicle. In this case, it is a Ford Explorer. And we say, "Rebuild this vehicle. You have three years to rebuild this vehicle to be more fuel efficient, to have lower emissions without sacrificing the performance that consumers will want in the vehicle." And seven of those teams have brought their vehicles to Washington, DC today. And I believe some Members are driving them around right now. And the most important part of this program is not the fact that we are trying out new technologies in vehicles. The most important part of this program is that we are helping to train that next generation of future engineers who will be building those future vehicles that we will be buying and driving. And I can assure you that nearly every one of those engineers, young engineering students that go through this program, are snapped up almost immediately upon graduation by major auto companies the moment they graduate. And it is a great—it is a modest effort, but you are absolutely right with the point of the question and the concern that we have about that next generation of engineers and scientists.

Ms. WOOLSEY. Thank you.

Madame Chairman, can I ask one more question? I have got—because I have got to go, and I can't wait for all of these long-winded men.

I have a question for Mr. Glotfelty.

I had office hours this weekend, and a scientist engineer came into my office and told me that he has a technology to make transmission of electricity more efficient. And they used his technology in Brazil, but we—he can't get any interest in the United States of America on how to be more efficient with electricity transmission for long distances. Where does he go?

Mr. GLOTFELTY. I—he should come to us, and we will put him in touch with the—our scientists at our national laboratories, our industry partners to see if his technology works on our system, and——

Ms. WOOLSEY. Right, because——

Mr. GLOTFELTY [continuing]. We would be happy to do that.

Ms. WOOLSEY [continuing]. I, you know, I am sitting there, I can't tell him.

Mr. GLOTFELTY. We would be happy to help.

Ms. WOOLSEY. I mean, he is from my District; he has to be brilliant, but I can't judge it, so okay. We will get your card, and——

Mr. GLOTFELTY. Yes, ma'am.

Ms. WOOLSEY [continuing]. You are going to be——

Mr. GLOTFELTY. Yes, ma'am. Thank you.

Ms. WOOLSEY. Thank you.

Chairman BIGGERT. Thank you.

Problem solved. That is fast work.

Let me come back to Mr. Magwood. The Department, you know, decided to split the Idaho National Engineering and Environmental Laboratory, INEEL, management contract into a clean up portion and a research portion of the designated laboratory for nuclear energy research, INL. Can you outline the Department's statutory authority to make this change and the Congressional consultation process that was used?

Mr. MAGWOOD. Principally, the authority to restructure the laboratories flows directly out of the Department of Energy Reorganization Act. The Secretary has the authority to start laboratories, terminate laboratories, change laboratories. It is very broad and very flexible. As we considered the possible approaches to this, we generally maintained our discussions within the Administration because of the fact that there were commercial contractual issues at stake. As you know, Madame Chairman, we did, before officially announcing that this was coming out, try to contact as many Members as we could that we thought would be interested, including you, and recognize that whenever you are dealing with these kinds of contractual marriages, there is always a balance between what you say publicly and—with the Congress, and what you wait until after you are able to make a procurement announcement. So we did the kind of consultation we felt was appropriate, given the contractual issues at stake, but I think—you know, I think one thing I would like to do is try to find a way to give Congress a little bit better advanced warning when these things are coming in the future.

Chairman BIGGERT. Thank you. I think that would have been helpful. We didn't know it until the day before the press release came out or so, so we would have appreciated a little bit more knowledge of that.

The budget, then, shows a reduction in the research and development activities of $34 million and an increase in the infrastructure costs of $33 million, so that is almost the same amount, so these—and these infrastructure costs were described as personnel transition costs associated with the contract changes to create the new lab. When the decision was made to split the contract at INEEL, did the Department know that some of these workers weren't going to fit into the new structure? And why does the Department have to take the responsibility for paying these transition costs to these workers, and at the expense, really, of the nuclear energy R&D?

Mr. MAGWOOD. The—as—I discussed with the Committee staff, I guess a week or so ago, that the numbers are an unfortunate coincidence. There is a reduction, overall, in nuclear research, which is primarily due to restructuring of some of the key programs. Advanced Fuel Cycle Initiative, for example, is requesting less, principally because we had made the determination not to pursue a commercial scale demonstration of one of the separations technologies. And there are other issues, as well, the restructuring of the NERI program from an independent program to one that is—that derives from our mainline research activities.

The increase in the infrastructure account that you spoke of is not related to those decreases, but is related to a direct transfer that was made to my office from the Office of Environmental Management. And the purpose of those resources is to, as you put it, to manage the transition of employees. We don't know, yet, how many employees will be employed by the Idaho National Laboratory contractor and the Idaho clean up project contractor, which is going to be working for the Environmental Management Office. And what this money does is it provides us an opportunity to maintain those people in place until those contractors have the full opportunity to talk with them and decide which of the employees they would like to have in their contracts. So this, in our view, was an appropriate way to manage a very, very difficult and complicated transition of contracts. And I think to be fair to the employees, it made sense to make sure they have an opportunity to look for jobs.

Chairman BIGGERT. Well, obviously, you know, they would have—there would have to be the costs, but why did the Department choose to saddle your office with the costs and not the environmental program?

Mr. MAGWOOD. Well, again, the money originally came from the environmental program. We did transfer the money. The reason that we are managing it is because we are now landlord for the site. It is our responsibility to make sure that the right people are in the right place to manage the various nuclear facilities to conduct the research at the laboratory, so it makes sense that we would have that responsibility. The Environmental Management organization is going to be focusing on the clean up of the site, and we are effectively abandoning certain areas to them so they can work quickly and efficiently and get their job done, and, quite frankly, get out of my way so I can build this laboratory.

Chairman BIGGERT. Okay. Thank you.

Just a question for Mr. Maddox. You haven't had the opportunity yet to answer anything. Given the importance of fuel cells to the hydrogen economy, could you address why the Department chose to

reduce funding for distributed generation systems, including the stationary fuel cells, by ⅔ or $48 million?

Mr. MADDOX. Yeah, just briefly, part of it is a combination of work being—reaching the maturity level where it should be picked up appropriately by the private sector to bring it to market. Some of it is that it is low-priority work, and I would say another portion of it is driven by the fact that we are starting up FutureGen, and work is being slowed down somewhat to define what work will be done in support of FutureGen going forward.

Chairman BIGGERT. But I think that, you know, Ms. Woolsey was just asking about if we were going to have the hydrogen become a, you know, hydrogen economy that we really need to start for things like the stationary fuel cells and the buses and things and it being slashed. This isn't going to happen then or——

Mr. MADDOX. No, stationary fuel cells, actually, are part of the FutureGen project, and it entails a large fuel cell component as part of that process. That is——

Chairman BIGGERT. But you still cut it by ⅔, though.

Mr. MADDOX. Well, for example, the fuel cells development program was cut, because it was ready from, I think, last year it was—$10 million was cut, because that project is now ready to be moved into another phase and be brought forward by industry. Tubular solid oxide fuel cells, again, same situation, a $12 million program. And so a lot of these cuts are being driven as much due to the maturity of research rather than cutting, per se.

Chairman BIGGERT. Thank you.

Mr. Larson is recognized.

Mr. LARSON. Thank you, Madame Chairman.

And following along that same line of questioning with respect to fuel cells, and without being too myopic and before I get further down the fuel cell line, I would be remiss if I didn't go back to the question I elaborated on before, but it ties directly to this in terms of the——

Mr. GARMAN. Yes, it does.

Mr. LARSON [continuing]. Practicality of introducing legislation that mandates municipalities and states, as they are looking at heating and cooling their buildings and providing fleets of vehicles and transporting students back and forth to school, that we provide the incentive here. Without a governmental incentive, because of the cost that Mr. Maddox just referred to in the R&D and how that is going to play out in Wall Street in terms of attracting dollars, the likelihood of attracting capital here is probably what will push this out, as Ms. Woolsey said, for decades. On the other hand, if we have the same kind of focus that we had on placing a man on the moon, we could probably embrace this thing in less than a decade, because the technology hurdles aren't as great as placing—in scientific hurdles, aren't as great as placing a man on the moon. Would you respond to that? And I will let all of the panelists——

Mr. GARMAN. Let me try to take a cut at weaving it together, because you are right, again, on point to this issue of R&D and deployment and when it is appropriate to take the technology out of the lab and get it in the marketplace through regulation, through incentives, through information, outreach, and other means. There are stationary fuel cells in the marketplace today that are being

bought by customers that need high degrees of reliability and that do not want to—you know, they need, what folks in Jimmy's line of work call 5–9—or 6–9 reliability, 99.999 percent reliability. And fuel cells are being bought by those sorts of people today. They are in the marketplace, and yes, they are more expensive, today. More experience in the marketplace with these will bring down costs, as unit costs go up.

With respect to buses, if—when—and municipalities ask us this question today: "I want to buy a clean fuel bus. What do I buy? Do I buy a fuel cell bus? Do I buy a natural gas bus?" And I will tell you candidly that my answer is usually—I think it is not quite—fuel cell buses aren't quite ready for the kind of performance and durability and reliability that you need. A natural gas bus is your answer today. A fuel cell bus will be your answer tomorrow. There is a lot of groundwork that has to be laid to prepare for the coming of this hydrogen energy economy. And let me give you just one example, because it is one of the areas that we have sought an increase for in our budget, and that is to work on safety, codes, and standards. There are 44,000 fire marshals in this country, each and every one of them with a different view of how hydrogen should be handled safely. And in each of these different—I mean, we are not going to reach large scale deployment of these technologies until we get a certain area of agreement and common—and—among all of these 44,000 different code jurisdictions about what is a safe way of handling hydrogen. How many sensors do you need in a vehicle to detect a hydrogen leak? And if we over-engineer this thing, and if we require, for instance, too many—and I think this point was made last week at this very panel at this very table. If you require too many sensors and controls in the code, in the standard that you promulgate, you will never get it out. And that drives the cost up.

So this is the kind of groundwork that we are working on to prepare for a greater market acceptance. It has to be done with some finesse and not necessarily with brute force. And so that is our approach; it is a very prescribed program plan. So I will say, I think it is early for mandates to tell, you know, let us push this—I think we need to work on the technology before we start to employ policy instruments to push that into the market.

Mr. LARSON. But doesn't that present the conundrum, then, that we have to work these things through, but the principle investors are saying, "Well, it is an untried and untrue industry, so why are we going to invest capital in this area?" And would it be that our major corporations were saying, "You know what, we are going to postpone those quarterly returns that we have been focusing on and go into the in-depth research and development so that we can long-term develop the product that is going to come." And if government doesn't step in and provide this opportunity, it is not going to happen, and we will be the proverbial dog chasing its tail, and it will. You know. It will be a self-fulfilling prophecy; we won't bring this to market or to fruition unless we come in and say, "You know what, we are going to provide the incentives for municipalities, minimally buses, that have to—are—you know, where you can store the hydrogen in one place, where they come back to a barn in the evening themselves, or a garage, so that there is the capability, minimally through pilots, that we ought to be exploring."

And it seems to me, in many respects, the military is outpacing the scientific community in terms of looking at fuel cells as a resource, and that is disturbing to me.

Mr. GARMAN. Let me just agree with you, in this respect, and you have identified municipalities, the military, the government itself, the Federal Government——

Mr. LARSON. Right.

Mr. GARMAN [continuing]. Will be very, very important first customers of this technology. And we are committed to that and that is part of our program plan. We envision that the government will be an important first customer of the technology. We may disagree on——

Mr. LARSON. Right.

Mr. GARMAN [continuing]. Precisely when that happens.

Mr. LARSON. Just a—as a follow-up to the next round of questions, the thing that I wanted to ask all of you, as panelists, and this is something, I think, that is near and dear to a lot of our hearts here, but—and it was discussed earlier about the brain drain and the need and I love the Future Truck concept. Is there any in Connecticut? And—but along those lines, and again focusing on the need for government to focus in these areas, how would the panel think about embracing, much in the—along the same line of the Civil Conservation Corps, an Energy Corps that—from, we will say, the middle school on up through college where we are starting, really, to focus on getting people's interest, but more than their interest, their direct involvement: summer employment opportunities; when they are in college or within their technical school, the opportunity to work with Department of Energy on specific programs and projected areas where expertise is going to be needed. I love to sit down with people that have—are of a like mind in dealing with your shortage in the nuclear area, the electrical, the fossil fuel area, and all of the other areas that are so vitally important to us and see if there isn't a way that we can, nationally, focus on this from top to bottom with incentives or funding from the government level, and even partnerships with the private sector.

That will be my next question.

Chairman BIGGERT. We will look forward to the answer to that question.

Dr. Ehlers is recognized.

Mr. EHLERS. Thank you, Madame Chair.

First, a question for Mr. Glotfelty. The Energy Policy bill, which passed the House and is currently stalled in the Senate, I felt, did not do an adequate job of dealing with the problem of electrical transmission and particularly the problem of controlling the Grid and making sure that we wouldn't have any further breakdowns of the Grid. What are you doing in the Department that is better than what we have in the Energy Policy bill? How are you—what programs do you have that you think are really going to insure against future blackouts of the extent that we have experienced twice on the East Coast and occasionally elsewhere?

Mr. GLOTFELTY. That really is the core focus of our program and why we became a stand-alone program. Our Transmission Reliability program, and the two new programs that we proposed for this year, GridWorks and GridWise, are specifically designed to

focus research efforts on those technologies that increase the capacity of the Grid as well as increase the reliability of the Grid. Technologies, advanced conductors, advanced power electronics, which allow us to control the Grid much more than we ever have been able to, are really the core of our Transmission Reliability program. We have spent a tremendous amount of time working with industry to figure out how we take the next step, as Mr. Garman has said, to get these technologies from the laboratory to actually tested on the transmission grid. It is a tremendous challenge in this area, because, as you know, if you have a problem on one part of the Grid, it can spread throughout the entire Eastern Interconnect or the Western Interconnect. So we have to be perfect in terms of ensuring the technology.

Mr. EHLERS. Actually, I am less concerned about the technical parts, because I think they are more easily solved. I am more concerned about the control parts where there is a control agency or entity or mechanism that prevents them from spreading. And as I understand in the last situation, the situation in Ohio was that the individual power plants or power companies controlled it, and therefore, they didn't take action, and it spread. What are you doing about the governments of the Grid as well as the technical aspects?

Mr. GLOTFELTY. Part of our program is a market analysis function, and that is to work with states and regions to help them better understand initiatives that are working either at the Federal Energy Regulatory Commission or through Congress, help them understand the need for regional planning, and how their neighbor really affects the operation of the Grid within their state and for their consumers.

You know, we have been in a—we have been kind of straddling the fence since about 1992 on wholesale power markets. Are we going to get there——

Mr. EHLERS. Yeah.

Mr. GLOTFELTY [continuing]. Or are we not? And as we continue to straddle the fence, state regulators are put in a position that they don't know which way to move. And we would encourage Congress to pass the energy bill. It does give quite a bit of certainty. It is—we need certainty for regulators; we need certainty for markets as well.

Mr. EHLERS. But not enough certainty, and that is why I am looking for the Department to advocate that. It is a matter of control, literally. And I recall back in the '50's, and actually in the '60's, when I was a pilot at that time, and was sure that, at some point, two jet airplanes were going collide in the air and we would have a horrible catastrophe. And the Air Traffic Control System could not set up to do that, because the companies didn't want that and every—et cetera, et cetera. And low and behold, two airliners crashed over the Grand Canyon, and then suddenly, we developed an Air Traffic Control System. And we have to do this. I mean, we have had our Grand Canyon a couple of times in the electric area, and it is time to say, "Look, we need a national control system that is independent of any individual power company, any individual state PUC or PSE, whichever they have, and that simply watches this and makes the decisions that have to be made to prevent it."

And I would appreciate it if the Department could work in that direction as well.

Mr. GLOTFELTY. We will. I—one thing I might add is our final report on the blackout of last August 14 will be coming out this coming Monday, the 29th. And included in there are a number of recommendations that move in that direction.

Mr. EHLERS. All right.

Mr. GLOTFELTY. I would be interested in your opinion.

Mr. EHLERS. I look forward to seeing that.

Mr. GLOTFELTY. Thank you.

Mr. EHLERS. Mr. Maddox, the request for FutureGen calls for $237 million this year, yet the FutureGen project plan says that just $18 million will be expended in fiscal year 2005. Now several other problems—programs in your Fossil Energy are being cut, for example, fuel cells are cut by $45 million, or 65 percent. Why should we set aside this money for FutureGen and not fund other priorities that are currently ongoing?

[No response.]

Mr. EHLERS. Microphone, please.

Mr. MADDOX. I am sorry.

Just briefly, the FutureGen line and the CCPI line reflect our priority of funding and building the FutureGen project, which, as we have mentioned, is a hydrogen, zero-emissions generation project. All of our programs and resources come in alignment with reaching this goal, and a number of these projects are likely to be funded and supported through the FutureGen research line. However, we think it is important, if we are going to attract the coalition and consortium partners and ask them to invest money, that they have some stability and confidence in our funding profile on FutureGen. I think we acknowledge that some of these projects may pause, but again, a lot of them will fall under future projects.

Mr. EHLERS. Okay. Thank you.

And I apologize for dashing in and out, but I have two other meetings going on simultaneously, so thank you.

Chairman BIGGERT. Thank you, Mr.—Dr. Ehlers. Well, we will start another round, so I will start with Dr. Decker. Some analysts say that the best budget that you can hope for is the $38 million, or one percent increase, recently passed in the Senate budget resolution. If you got such an increase, how would you spend it? This is supposed to be a positive question.

Dr. DECKER. I appreciate those. What—our highest priorities are to operate our scientific facilities at their full capacity. I am pleased to say that, as I mentioned in my oral remarks, that we, in our 2005 request, plan to operate our facilities at 95 percent of optimum, but we certainly would like to get to 100 percent of optimum. Our other high priorities are certainly ITER and high-end computation.

Chairman BIGGERT. Okay. Thank you.

Mr. Garman, in February of 2003, a central theme of Under Secretary Card's testimony was the Climate Change Technology Program. And he stated that DOE energy supply programs, primarily your office, accounted for 90 percent of the CCTP funding. And then in our February 2004 budget hearings, the CCTP wasn't even mentioned by our DOE witness. And this year, the DOE budget

makes almost no mention of the National Climate Change Technology Initiative (NCCTI), but in your testimony, for the first time, DOE mentions that CCTP is about half of the $4 million in federal climate change spending. So—did I say what? $4 billion. Do you have more specific numbers? And how come we haven't heard anything about this program before?

Mr. GARMAN. All right. Let me take a shot at that.

Frankly, a great deal of what we all do, the first point that needs to be made, relates to climate. When you add the $4 billion worth of R&D activities that is spread among Nuclear and my office and a little bit in Science and in Fossil, that is R&D directly targeted at reducing, or avoiding, emissions of greenhouse gases. In addition to that, the President, in his National Energy Plan, has advocated another $4 billion worth of tax incentives for hybrid vehicles, for combined heat and power, and other efficiency measures to help reduce emissions of greenhouse gases. So in that sense, we do a great deal of climate work.

Several years ago, we proposed a special fund under the rubric NCCTI and that morphed into Climate Change Technology Program, or CCTP, to do some strategic planning to make sure that the R&D activities were strategically targeted and to be able to prioritize among those activities to see which could generate the greatest reductions in greenhouse gases. And in addition to that, we had proposed a $40 million unbounded solicitation, to be awarded competitively, to people who were bringing new and novel ideas to the table that might not be covered in any of our programs. Congress decided, quite explicitly, not to fund that activity last year. Page 142 of the conference report of the Energy and Water Development bill last year states, "The conferees provide no funds for the National Climate Change Technology Initiative (NCCTI), consistent with the rationale provided in the House and Senate reports." So we have, for several years, asked Congress for funding to do this overarching activity. Each year, Congress has said no, so we will continue the best we can working on the fundamental, underlying technology programs that we have. We have asked for $6 million this year: $3 million for the unbounded solicitation, and $3 million for analysis, program direction, management, and other things.

Chairman BIGGERT. Thank you.

Dr. Decker, my colleagues in the Energy and Water Appropriations Committee have made their support for the Office of Science's Advanced Scientific Computing Program abundantly clear by stating that it is one of the most important programs that account for economic growth. Can you provide examples of how a leadership class computation facility the number two priority in—on your facilities list might contribute to a competitive edge for American businesses?

Dr. DECKER. Madame Chairman, I think that high-end computation has enormous potential to pay off in a number of ways for the country, first, in the way it can advance scientific discovery. Leadership class machine means that we can get into a whole new realm of simulation on very important scientific problems from, you know, fusion research to climate change to nanoscience and technology.

We—I think, as far as economic competitiveness is concerned, probably the biggest near-term payoff will be in virtual prototyping where companies will be able to simulate the behavior of very complex items that they wish to produce and really reduce the cycle time from product idea to production. We have an activity going now with the Council on Competitiveness where we are working with industry to see what payoffs industry really sees in the high-end computation for them through leadership class machines. They are going through a study that is probably to be completed by the middle of this summer.

Chairman BIGGERT. Okay. Thank you.

Mr. Larson.

Mr. LARSON. Following along on the question that I proposed, then, my intention is—it is like, I know, in many respects, it is asking you to comment on the meaning of life, but I intend to set up meetings with your respective offices and pursue that in this context that I believe, and I am sure you do, as well, that the defense of the Nation, its continue economic and energy and educational productivity are inextricably tied and linked, how can we address that in the context of a proposal, such as some kind of energy tech corps that we could start? And that is what I will be pursuing with.

In a more general area, and getting back to this issue of manufacturing, can you highlight ways in which, in your respective agencies, that R&D activities impact local economies, jobs, and manufacturing?

And then I have a specific question for Mr. Glotfelty that I want to ask about superconductors. So——

Mr. GARMAN. I will take the first crack.

I look at the automotive industry, which, in the aggregate, is responsible for a huge number of jobs in the U.S. economy. And I look at the maturity of the U.S. market. And what is really happening is fratricide, as companies fight against one another for market share. And if you really want to grow this manufacturing business, one of the things that you will need to do is look for new markets in emerging economies, like Brazil and India and China, and we think that is precisely on point and is one of the things that the FreedomCAR program does. I think when General Motors realized that we are in a fight here, in this very mature automotive market, for decreasing amounts of market share, we need to, over the long-term, develop a different kind of vehicle that can be marketable around the world and can achieve sustainability objectives and cost objectives that can make them affordable around the world. And that is when they developed this autonomy concept, which is a fuel cell vehicle, meant to be simpler, easier to manufacture, and over the long-term, lower in cost. So that is one example.

Mr. LARSON. Aren't the Germans and the Japanese way ahead of us in those areas?

Mr. GARMAN. I don't believe that they are. I was in Japan two months ago, and I think the competition is underway, but I believe the United States is ahead, at this moment, in fuel cell technology. And the important thing is for us to be able to maintain that lead.

Mr. LARSON. How would some of the other panelists respond?

Mr. GLOTFELTY. In the electric sector, creating jobs at the local level is key. The problem that we face in Transmission and Dis-

tribution, is the long life cycles of the equipment that are on the transmission grid, most of them are—have a 40-year life cycle. So we hope that there will be renewed focus on producing equipment here in the United States. The majority of transformers built for the U.S. market are built overseas. It is a huge national security issue. We need to refocus our efforts here, as the life cycle of these components on our transmission grid reach their life cycle. Many of them were put on 35 or 40 years ago.

Mr. LARSON. How is your HTS program proceeding? And is that—does that present itself a great opportunity for us for economic growth?

Mr. GLOTFELTY. A great opportunity, absolutely. It is the largest component of our office. It—I think, in 2004, it got 78 percent of our discretionary funding. It has the opportunity, over the next decade or so, to revolutionize the electric industry, with the majority of the components, the wires, being built here in the U.S. That is why it is so important to our program.

Mr. LARSON. Mr. Magwood.

Mr. MAGWOOD. It would be easy to talk about the huge economic impacts nuclear—new nuclear power plant constructions can—could have on local communities. There are communities in this country that exist because somebody put a nuclear power plant there. But what I have seen, that is really quite interesting over the last couple of years, is that the interest that people have had in nuclear power is not just because it is a great way of making electricity, but because they find that there are other energy resources, for natural gas primarily, that are being used for other purposes—that need to be used for other purposes, such as in the chemical industry, that are now finding that they can't find the gas to fulfill their needs at the prices they need. And so nuclear power's real potential, it seems to me, is as a part of a larger economy in terms of supplying heat to industry, making hydrogen for a wide range of purposes. And in the Southwest, making clean water for local communities. So I think that as we start to think about nuclear power in the next few decades, it won't just be in the electricity story; it is going to be a much broader story, and that is a big part of it.

Mr. LARSON. Mr. Maddox.

Mr. MADDOX. Thank you.

I think Fossil's role is pretty straightforward in that if you look at the pressures right now, natural gas prices, oil prices, we serve two functions. The first is to try to extract our domestic resources more efficiently, through better drilling techniques, through more sounder exploration activities. Also, on the user end, we are pretty involved in creating more efficiencies in the burning of fossil fuels, and, obviously, have a major commitment to burning coal more efficiently, anything we can do to expand the use and lifetime of our resources. One of our major challenges right now is our depletion rate is extremely high in the oil and gas fields due to better technology. We find gas quicker and oil quicker, and we also drain the fields quicker, so we need to try to find ways to get every drop out of these reservoirs. A good example is our CO_2 enhanced oil recovery benefits, which also has environmental side effects.

But essentially, our goal is to try to increase efficiency and keep fuel affordable so we can keep creating jobs. As we all know, that is—as a child of the '70's, coming out of Ohio, I know, you know—grew up where we saw the impacts of energy uncertainty on the economy.

Mr. LARSON. Dr. Decker, I didn't know if you wanted to respond to that.

Dr. DECKER. Mr. Larson, the impacts of basic research on the economy and jobs is often very difficult to predict in advance, as you know. But if we look back historically, there are—the Office of Science Programs have had some major impacts on jobs and the economy. The whole nuclear medicine industry grew out of research that was funded by our office. We——

Mr. LARSON. Has anyone ever calculated all of that in terms of—with all of the monies that have been placed in R&D, et cetera, because oftentimes the community gets blind, because they say, well, this is——

Dr. DECKER. There have been some studies. There have been some general studies of the effect of Federal R&D on the economy. There have certainly been a lot of anecdotal kinds of stories that have been developed about specific contributions that have come out of programs like ours, but I don't think we really have a comprehensive study, the type that we—that would be very nice to have. Of course, these studies get somewhat difficult to put together in terms of the source.

Mr. LARSON. But it would be nice to prove that the scientific community is a value-added community in that respect, because we are—and, you know, to Mr. Garman's point, if the—if we are looking for the ability to export new technologies abroad, hopefully, we have got the proof that shows the correlation between the funding, the research and development, and then the birthing of these new industries or offspring of or offshoots of——

Dr. DECKER. I agree with you. We need to develop that story better, and we will try to do that.

Chairman BIGGERT. There must be some sound science way that we can do that. I am sure that somebody will come up with it.

Thank you.

Dr. Decker, you recently released your Strategic Plan and the 20-Year Facilities Plan. And that plan assumes that the Office of Science will receive funding at levels in—commensurate with H.R. 6. The fiscal year 2004 appropriation did not match that level, and the President's budget does not match the proposed authorization level for fiscal year 2005. But in your testimony, you state that it is our intention to proceed according to the plan's delineated priorities, as circumstances will allow. So what, specifically, does that mean, and how will you balance the need for new facilities to remain at the cutting edge of scientific research with the need to maintain runtime and research, including support for graduate students at the existing facilities?

Dr. DECKER. Madame Chairman, I—the 2005 budget request does allow us to get a start on five of the facilities that were identified as high priority in the facilities outlook. There is R&D funding for the Rare Isotope Accelerator. There is funding for the Linac Coherent Light Source, the Ultra Scale Computing Initiative, which

in some sense, is not a—you know, sort of a typical scientific facility of a type that we normally build. The joint dark energy mission is also funded with R&D. And then there is preliminary engineering design request for the first of the Genomes to Life facilities for Production and Characterization of Proteins and Molecular Tags.

So I think that in this budget request, we are getting a good start on these facilities. The question you raise about balance between starting new facilities and continuing operations of our current facilities and also balancing against research, which has nothing to do with facilities or research—researchers that use the facilities, is a continuing problem that we have every year in the budget. And I—on the one hand, we certainly want to operate our current facilities and get maximum utilization of the taxpayers' investment in those facilities, but science and technology doesn't stand still, and we need to move on to the future and provide our scientific community with new capabilities that keep this country at the leading edge in science and technology.

So it is a difficult balancing act. We think that we have done it appropriately at this budget, and we will try to continue to do so.

Chairman BIGGERT. Now with—of the five new facilities that are scheduled for fiscal year 2005, which of the five has the largest outyear commitments, and which would suffer the least from a delay in funding?

Dr. DECKER. Well, the Rare Isotope Accelerator is the largest of the facilities. That is a billion-dollar class facility. The others are—well, I would say the next largest facilities, and several on this list are sort of in the $250 million to $300 million range, so that is—RIA is, by far, the largest.

Chairman BIGGERT. Would that be the one that would suffer the least from a delay in funding or is——

Dr. DECKER. Well, if we have real budget problems, then—real budget constraints, and the—we would probably have to delay construction on RIA. That would be my guess.

Chairman BIGGERT. I think that the Committee staff met with NASA science officials yesterday, and they indicated that NASA is part of the joint Dark Energy Mission project, it is not in NASA's fiscal year 2005 budget request, nor is it in the five year budget planning horizon, so it seems that NASA might have a lack of enthusiasm for that project, so do you intend to reconsider your request for the $7.5 million for that program?

Dr. DECKER. Madame Chairman, we do have ongoing discussions with NASA on that issue, and clearly, we hope that it will be put back into their plans. If it is not, then we are going to have to come up with another course of action. I mean, that is a very exciting experiment, so—and I think NASA actually—their scientific folks have been very excited about that possibility. We are still addressing it.

Chairman BIGGERT. All right. Thank you.

Mr. Larson, do you have any questions?

Mr. LARSON. Yeah, I just have one final, and this is pretty much one of curiosity as anything, but, for Mr. Magwood, with respect to your—I share your concerns about nuclear energy. It seems to me that we have never recovered from the China syndrome (nuclear meltdown), and—but going forward, how do you put in context an

industry where there is deep concern, on one hand. How many facilities are being decommissioned across the country currently? What sort of security threat does that present to the United States in terms of both the decommissioning and containment issues? And is there a way in which we can reengage this argument from a security perspective and not the sense of global dependency on nuclear that, I think, ultimately with Three Mile Island, and all of the other stuff, force people to think differently?

Mr. MAGWOOD. I appreciate that question. It is really the question that I deal with on a daily basis, because the fact is that nuclear power is alive and well in the United States of America. We operate 103 nuclear power plants today that provide about ⅕ of all of the electricity that is generated in this country. Most people don't realize that. We are not turning nuclear power plants off in this country; the number has actually been stable for quite some time. And in my conversations with the chairman of the Nuclear Regulatory Commission, it is pretty clear that virtually all of the plants that are in operation, they are going to be relicensed or, at least, will seek new licenses. So nuclear—these 103 nuclear power plants will operate well into the middle of this century.

So nuclear is not going anywhere for quite some time. The real—the question, I think, and I think this gets to the thrust of what you were saying, is what about new plants. How do we turn the psychology around? And I think, from what I have seen, that the psychology already has turned around quite a bit in this country. When we talk to college students and others, there really aren't the kinds of fears about nuclear power that I think popularly the media would report. As a matter of fact, along the lines of your other question, I—you know, I and my colleagues have been traveling around to different high schools, talking about hydrogen, in particular, but in my case, hydrogen and nuclear power. And I was actually in Idaho last week visiting with high school students about that and was really amazed to see how well informed these students were about nuclear, and they asked all of the right questions. But they were not afraid of it. They really felt that their questions needed to be answered, but they were confident that the questions could be answered. There was not a knee-jerk reaction against nuclear.

And I think that when you go to plant sites around the country and talk to the communities around those plant sites, you find communities that are well informed about nuclear power, the pluses and minuses, like there are pluses and minuses in everything. And you see people who are not afraid of nuclear power and don't have these reactions. And the fact that we have not had serious operational issues in this country, have changed the poll numbers. You know, as we have looked at the poll numbers, they trend upwards over the last decade. So I actually think that the environment is right for research on nuclear power. The only thing that is keeping utilities from building the plants today are—is that the business case has not appeared for them. They—the economic case hasn't risen yet. And that is really what we are working on. We, with the industry, are trying to find a way of going forward with these plants that is a good business decision for CEOs of electric utilities.

And I think that the business case is a lot closer than a lot of people think it is.

Mr. LARSON. You know, I—just to comment, Madame Chairman, I really enjoy serving on this committee because of its bipartisan nature and the shared concern and work that we all have. I meet with students frequently, and one of the most disappointing things for me, in talking to students, is their total lack of faith in politicians and government, not government, but oftentimes—because they understand it is power, but politicians and people that are in government service. And in a number of our institutions, especially financial institutions, et cetera, their great hope lies in health and science, because they believe in their heart that you are in pursuit of the truth. It is a precious thing. And it is a great inspiration. And to the extent that your agencies, collective agencies, can continue to instill that this is an endeavor that we must instill in our children and hopefully it will spill over to other institutions and other areas as well. And I thank Madame Chairman.

Chairman BIGGERT. Thank you.

I was going to end it there, but I just have just one more question based on that, because we are talking about the students, and I was pleased to learn, too, that enrollments are increasing in the nuclear science and engineering departments at the—at universities nationwide, and I think that is so important. And I, too, go into schools, starting at kindergarten through high school, and—to really encourage students to look at the sciences and engineering, and particularly women, because I think that this is a real opportunity that they have and haven't taken advantage of.

But given the recent increases in enrollment in the university nuclear programs, is there still a need to strengthen programs at DOE to—designed to support the university programs and facilities?

Mr. MAGWOOD. I think so. The demand for the growth in these programs is actually still not—the demand for new people in the nuclear field still isn't quite being met. There has been a huge amount of progress, you know. Don't mistake me. I am very happy with what we have been able to accomplish working with the universities. But for the—we are looking at a situation in this country, over the next 10 years or so, that a huge number of the nuclear experts who are out there today are operating our nuclear power plants, working in our national laboratories, working in government, are going to retire. Most of the people on my staff, for example, are within five years of retirement. And the people coming from universities aren't coming out fast enough to fill what is going to be a cliff in the Federal Government in nuclear sciences and technology. Actually, I think that is not just true for nuclear; it is true for almost all of the physical sciences, because we are—as this committee pointed out in the material you provided, we are actually losing the hearts and minds to our friends in the life sciences. They are eating our lunch, quite frankly. And that is where the kids are going; they are going into life sciences.

So you know, 10 years from now, you may not see a Department of Energy that is as strong as the one we have now, because the expertise base is beginning to erode, and unless we are able to turn the situation around in the schools, even more than what we have

done already, both in the nuclear and other fields, the—we are going to have a very, very serious situation in this country.

Chairman BIGGERT. And with that, I will just put in a plug for the bill that I recently introduced, 3828, which is the DOE–University Nuclear Science Engineering and Health Physics Act that further strengthens your office university program, so I look forward to working with you on that.

But the time is 12 o'clock, so before bring this hearing to a close, I want to thank our panelists for testifying before the Subcommittee today. If there is no objection, the record will remain open for additional statements from the Members and for answers to any follow-up questions the Subcommittee may ask the panelists. Without objection, so ordered.

The hearing is now adjourned.

[Whereupon, at 12 p.m., the Subcommittee was adjourned.]

Appendix:

Answers to Post-Hearing Questions

ANSWERS TO POST-HEARING QUESTIONS

Responses by James F. Decker, Principal Deputy Director of the Office of Science, U.S. Department of Energy

Questions submitted by Chairman Judy Biggert

Coordination with Other Federal Agencies on Fundamental Computer Science

Q1. How are you coordinating with other agencies on fundamental computer science research that will lay the groundwork for the future generations of supercomputers? Are the funding or programmatic requests in your budget in any way contingent on other agencies' contributions? What specific hardware or software, if any, are being acquired with other agencies? Please describe the specific steps DOE is taking to ensure that investments are of maximum utility across scientific disciplines and not redundant with other agency purchases or research efforts.

A1. There are several mechanisms that we use to accomplish effective interagency computer science research coordination. Examples of the coordination efforts are:

a) A Memorandum of Understanding (MOU) is in place among the Office of Science (SC), the National Nuclear Security Administration, and the Department of Defense (Defense Development Research and Engineering, the Defense Advanced Research Projects Agency (DARPA), and the National Security Agency (NSA)) for the coordination of high-end computing activities. The MOU specifies several areas of coordination, including research, and requires an annual high end computing plan.

b) SC played a major role in the development of the High-End Computing Revitalization Task Force (HECRTF) research plan.

c) As a part of the agency activities following development of the HECRTF plan, SC, DARPA, and the National Science Foundation (NSF) have established a high end computing university research activity focused on improved coordination of university-based research in high end computing. In FY 2004, SC and NSF coordinated computer science research announcements in operating systems (SC) and system tools (NSF). DARPA provided additional funding to augment these research activities.

d) SC is a mission agency partner of the DARPA High Productivity Computer Systems program and coordinates/co-funds research activities in development and execution metrics with this program.

e) SC coordinates and co-funds research activities in programming languages and benchmark metrics with NSA.

f) SC also participates in the High-End Computing and Computation Coordinating Group of the National Coordinating Office for Information Technology Research and Development.

Generally, requests in the budget are not contingent on other agencies' contributions. However in certain areas, such as hardware testbeds for computer science, researchers funded by SC will have access to systems funded by other agencies for testing purposes.

No hardware or software acquisitions are currently underway, or planned, with computer science research funding.

The coordination efforts a) through f), described above, all contribute to assuring that our research activities are not redundant with other agency purchases or research efforts. An important characteristic of SC computer science research is an ongoing focus on end-user (scientific discipline) requirements. An example of this is the DOE Scientific Discovery though Advanced Computing (SciDAC) activity, in which four computer science Integrated Software Infrastructure Centers are funded to deliver improved performance, data analysis, language inter-operability, and resource management to SciDAC applications. An integrated program management process within SC ensures that these activities remain responsive to end-user requirements.

Joint Dark Energy Mission (JDEM)

Q2. During the hearing you stated that you would continue to work with NASA on the Joint Dark Energy Mission (JDEM) despite its absence from NASA's FY05 request. Given that NASA may not be able to fund the JDEM, what alternatives

is DOE pursuing? Would a ground based experiment be possible? If so, how much would that cost? What would be the disadvantages of doing so?

A2. The National Aeronautics and Space Administration (NASA) Office of Space Science has stated publicly that it is fully committed to realizing a dark energy mission jointly with the Department of Energy (DOE). The JDEM is part of their Beyond Einstein program (it is the Dark Energy Einstein Probe), even though funding is absent from NASA's FY 2005 budget submission. NASA officials have stated that they will proceed with JDEM by funding mission concept studies and by laying out the mission's goals and organization jointly with DOE. DOE is continuing its JDEM R&D activities at a level which we believe should demonstrate a viable mission concept by FY 2006.

There are a number of ground-based telescopes being developed to measure Dark Energy using complementary techniques. These experiments will be able to measure the effects of Dark Energy on the universe. One such experiment, the Large Synoptic Survey Telescope (LSST) is estimated to cost approximately $280,000,000, but DOE has not yet reviewed this estimate and the National Science Foundation is expected to be the lead federal agency for this proposal. To fully determine the underlying nature of Dark Energy, however, a space-based mission to measure the acceleration and deceleration history of the universe over time is needed. There are two reasons why this is the case. From the ground, one cannot (1) see back far enough in time (10 billion years ago) because of the effect of the Earth's atmosphere, or (2) make measurements of sufficient precision to make the necessary determinations. This issue was addressed in much greater detail by a 2003 report of the National Academy of Sciences, *Connecting Quarks with the Cosmos: Eleven Science Questions for the New Century* (see pages 144–148; available on-line at books.nap.edu/catalog/10079.html).

Question submitted by Representative Lincoln Davis

ITER

Q1. I understand the ITER project is a top priority for the Administration but I am concerned that the Fusion Energy Sciences budget supports this international program at the expense of research being conducted in the United States. Can you assure me that domestic research is not being delayed?

A1. The Fiscal Year 2005 budget request does not reduce the overall level of domestic fusion research to any significant extent as a result of ITER preparations. Experimental, theoretical, and enabling technology domestic fusion research, where appropriate, is re-oriented more toward the needs of ITER, but is still performed by our current fusion scientists and engineers. Only a small amount, on the order of $1,000,000, of the FY 2005 ITER preparations request of $38,000,000 is for industrial preparations. This reorientation of fusion research has resulted in some shifts in priorities, such as reducing facility operating time and focusing technology more on the near-term, but overall domestic fusion research is essentially level. These shifts will create some dislocations and staff reductions in the program, some of which may be mitigated when we have completed the distribution of funds associated with competitive solicitations. However, as the National Research Council report on Burning Plasma Physics concluded, we no longer have a domestic program and an ITER program. We have a single integrated fusion program that includes ITER.

ANSWERS TO POST-HEARING QUESTIONS

Responses by David Garman, Assistant Secretary for Energy Efficiency and Renewable Energy, U.S. Department of Energy

Questions submitted by Chairman Judy Biggert

Q1. The FY04 Energy and Water appropriations directed the Department to use $13 million in prior year balances to fund renewable energy programs at the Department. According to your testimony, most of these balances were located in the Biomass program. Please explain how the use of prior year balances caused program authority to be reduced to $75 million, from $94 million reported in the budget.

A1. The Biomass program is funded through both the Energy Supply account within Energy and Water Development Appropriations bill ($86.5 million) and the Energy Conservation account of the Interior and Related Agencies bill ($7.5 million) for a total of $94 million. Because the Biomass program ended FY 2003 with $15.6 million of unobligated balances within the Energy Supply account, the program was allocated $11.4 million of the Committee's directed reduction to $13 million in Renewable Energy prior year balances in FY 2004. Of the $86.5 million of FY 2004 budget authority shown in the FY 2005 request, $75.1 million is derived from new budget authority and $11.4 million is derived from prior year balances.

Q1a. How did this use of prior year balances affect R&D progress in the Biomass program?

A1a. The use of prior year balances did not affect our R&D progress. However, earmarks in the program have affected progress. For example, available funding for four multi-year biomass research solicitation awards announced in September 2003 totaling $7.2 million was reduced to $1.2 million. The four projects were announced in September 2003 after a rigorous competitive process that included 400 submissions. The funding reduction also impacted the research and development target for our Sugar Platform from $0.07 per pound for mixed sugars in 2010 to $0.10 per pound in 2012.

Q1b. Why is this program prone to unspent funds?

A1b. The program is susceptible to having unspent funds for several reasons. One reason is the large number of congressionally directed projects. Often the intended recipients have not received federal funds previously and need assistance in understanding federal procurement requirements as well as learning how to develop a statement of work and a project management plan. Helping them through the process takes time and results in these projects being awarded late in the fiscal year budget cycle with little time to responsibly spend their first year awards. Another reason is that the continuing budget resolution lasted until nearly mid-year, thereby reducing the administrative time available to establish formal cooperative agreements and project management plans.

Q1c. You also noted that, due to the $41 million in earmarks, progress was delayed toward the goals of the program, and core capabilities at the National Labs were diminished. What goals were delayed, and by how long?

A1c. The funding reduction impacted the research and development target for our Sugar Platform from $0.07 per pound for mixed sugars in 2010 to $0.10 per pound in 2012. The syngas target was adjusted from $6.00/mmbtu in 2010 to $7.58/mmbtu in 2012 in light of what we thought was achievable given the earmarks.

Q1d. How has the lab capability been diminished, and how can it be restored?

A1d. The effective reduction of funds as a result of earmarks has negatively affected our core capability at the National Bioenergy Center (NBC), the main Laboratory group that supports the Office of Biomass Program. The NBC is comprised of the National Renewable Energy Laboratory (NREL), the Oak Ridge National Laboratory (ORNL), the Pacific Northwest National Laboratory (PNNL), the Idaho National Engineering and Environmental Laboratory (INEEL) and Argonne National Laboratory (ANL). As a result of earmarks, FY 2004 funds to the NBC were reduced by $7 million in core research and resulted in the reduction of 11 Full Time Equivalent (FTE) employees. The 11 FTE reduction resulted in the layoff of five staff (INEEL and NREL) and the internal transfer of another six (INEEL, ORNL, PNNL and NREL).

Our research and development planning is done in advance which allows the laboratories to identify the appropriate number and type of technical staff needed to carry out the research agenda. The staff members are hired by scientific discipline and are not necessarily able to work on other projects outside their expertise. When funding is effectively reduced through earmarks, the Laboratory cannot support staff whose research skills are no longer needed; as a result, intellectual capital is lost. It takes time to restore core competencies.

Q2. In your testimony, you provided the fiscal year 2005 funding breakout for basic research, applied research, and development activities for your office. Please provide the comparable fiscal year 2004 numbers, and the cost-sharing ratios for each category in each year.

A2. My written testimony actually included a table covering fiscal years 2003 through 2005; it is reproduced here for convenience:

Direct Federal Investment - Research and Development

	(budget authority in thousands)		
	FY 2003	FY 2004	FY 2005
Energy Efficiency and Renewable Energy			
Basic Research	30,577	31,115	30,092
Applied Research	279,895	303,533	269,228
Total, Research	310,472	334,648	299,320
Development	371,842	394,614	345,608
R&D Equipment	5,415	6,086	5,450
R&D Facilities	770	4,000	7,500
Total, Research and Development	688,499	739,348	657,878

Those figures are calculated based on estimates of the percentage of basic research, applied research, etc., in major areas of our programs—DOE does not have a financial system that can tie specific funding lines to a specific amount of cost-sharing. The new financial planning system that EERE is currently developing will have that capability, and in the next budget cycle we will be able to provide much more precise information about both cost-sharing and funds allocated to different stages of R&D.

At present, without manually reviewing every current R&D contract and agreement, I can tell you the basic principles that we use in establishing cost-sharing requirements. Basic research is usually performed at universities and national laboratories, which do not provide cost-sharing, but even if it were performed by a private company, we generally would not seek cost-sharing at that early stage. For the portions of applied research and of development that are performed by industry through cooperative agreements, CRADAs, and other mechanisms, we generally seek a minimum of 20 percent cost-sharing, which can escalate to as much as 50 percent or more in the later stages of development. If a technology progresses to the demonstration phase, we generally require a *minimum* of 50 percent cost-sharing.

ANSWERS TO POST-HEARING QUESTIONS

Responses by Mark R. Maddox, Acting Assistant Secretary for Fossil Energy, U.S. Department of Energy

Questions submitted by Chairman Judy Biggert

Q1. The President's Management Agenda (PMA) includes government-wide provisions on budget and performance integration that have been implemented through the Program Assessment and Rating Tool (PART). In addition, the PMA also introduced R&D Investment Criteria that were piloted in DOE's applied R&D programs.

Q1a. How do these activities dovetail with the reporting requirements of the Government Performance and Results Act of 1993*?*

Q1b. What specific steps is the program taking to avoid duplication of effort for these data collection efforts?"

A1a,b. OMB developed two tools for evaluating how well federal programs were being planned and managed, and delivered results. The R&D Investment Criteria (RDIC) scorecard, which was further developed and piloted by DOE's applied R&D programs. The second was the PART. OMB's guidance this year on the PART clarified that agencies should use the PART as the instrument to periodically evaluate compliance with the Criteria at the program level. The PART was modified to clarify its alignment with the Criteria.

The *Government Performance and Results Act of 1993* (GPRA) requires federal agencies to develop plans through which performance can be measured on a periodic basis. PART strengthens GPRA by requiring managers to report on results (one-half of the total PART score is based on demonstrated results) and mandating that performance data is included in budget justifications. This helps improve the quality of performance measures by ensuring alignment between program activities and agency mission. The performance information in agency GPRA plans should be revised to include any new performance measures used in the PART, and unnecessary measures deleted from the GPRA plans.

Performance information is included in several places because it is used for different purposes. For example, performance measures included as a component of a program's PART assessment are often included in the Department's performance budget. Performance measures included in the Department's performance budget are tracked within Joule, the Department's performance measurement system. The results of performance measures tracked in Joule are reported annually in the Department's Performance and Accountability Report (PAR), which is mandated by GPRA and implemented through requirements articulated in OMB Circular A–11, Part 6.

Fossil Energy R&D/Cost-Sharing

Q2. Using the definitions in OMB Circular A–11, what is the proposed mix of funding in the FY 2005 budget request between basic research, applied research, development, demonstration, and deployment activities for your office? Please provide the comparable FY 2004 numbers, and include the cost-sharing ratio for each category.

A2. Please see the table that follows:

RESEARCH AND DEVELOPMENT ACTIVITIES
(Dollars in Thousands)

PROGRAM: Fossil Energy R&D

		FY 2003	FY 2004	FY 2005
Conduct of R&D (Operating Expenses):				
1412 Basic Research	B.A.	$8,966	$9,277	$9,055
	Obs.	9,948	9,615	9,189
	B.O.	8,723	9,006	9,055
1422 Applied Research	B.A.	$176,211	$206,599	$179,511
	Obs.	245,888	221,555	212,548
	B.O.	244,162	208,595	200,555
1429 Total Research	B.A.	$185,177	$215,876	$188,566
	Obs.	255,834	231,170	221,737
	B.O.	252,885	217,601	209,610
1439 Total Operating Expenses – R&D	B.A.	$414,151	$540,061	$515,126
	Obs.	621,723	468,022	659,388
	B.O.	616,353	447,488	524,425
Physical Assets:				
1322 Capital Equipment	B.A.	$0	$0	$0
	Obs.	0	0	0
	B.O.	0	0	0
1312 Construction	B.A.	$2,000	$6,955	$7,000
	Obs.	4,510	6,200	6,850
	B.O.	2,900	5,995	6,450

		FY 2003	FY 2004	FY 2005
1399 Total Facilities	B.A.	$2,000	$6,955	$7,000
	Obs.	4,510	6,200	6,850
	B.O.	2,900	5,995	6,450
Grand Total R&D and Facilities	B.A.	$416,151	$547,016	$522,126
	Obs.	626,233	474,222	666,238
	B.O.	619,253	453,483	530,875

Memorandum (non-add) R&D Entries:

Conduct of R&D performed by Colleges and Universities:				
		FY 2003	***FY 2004***	***FY 2005***
1441 Direct Costs	*B.A.*	*($32,300)*	*($34,000)*	*($33,500)*
1442 Indirect Costs	*B.A.*	*($13,900)*	*($14,100)*	*($14,000)*
1439 Total, College and Universities	*B.A.*	*($46,200)*	*($48,100)*	*($47,500)*

Allocation of Research Funds				
1451 Research performed at Congressional Direction	*B.A.*	*($6,000)*	*($6,000)*	*($6,000)*
	Obs.	*(7,000)*	*(6,000)*	*(6,000)*
	B.O.	*(7,000)*	*(6,000)*	*(6,000)*
1452 Inherently unique research	*B.A.*	*($41,000)*	*($40,000)*	*($40,000)*
	Obs.	*(41,000)*	*(40,000)*	*(40,000)*
	B.O.	*(37,000)*	*(36,000)*	*(36,000)*
1453 Merit-reviewed with limited competitive selection	*B.A.*	*($27,000)*	*($28,000)*	*($28,000)*
	Obs.	*(27,000)*	*(28,000)*	*(28,000)*
	B.O.	*(27,000)*	*(28,000)*	*(28,000)*
1454 Merit-reviewed research with competitive selection and internal (program) evaluation	*B.A.*	*($79,177)*	*($111,876)*	*($109,610)*
	Obs.	*(148,834)*	*(127,170)*	*(117,737)*
	B.O.	*(146,885)*	*(115,601)*	*(107,610)*
1455 Merit-reviewed research with competitive selection and external (peer) evaluation	*B.A.*	*($32,000)*	*($30,000)*	*($30,000)*
	Obs.	*(32,000)*	*(30,000)*	*(30,000)*
	B.O.	*(35,000)*	*(32,000)*	*(32,000)*
		FY 2003	***FY 2004***	***FY 2005***
1459 Total Research	*B.A.*	*($185,177)*	*($215,876)*	*($213,610)*
	Obs.	*(255,834)*	*(231,170)*	*(221,737)*
	B.O.	*(252,885)*	*(217,601)*	*(209,610)*

RESEARCH AND DEVELOPMENT ACTIVITIES
(Dollars in Thousands)

PROGRAM: Clean Coal Technology				
		FY 2003	**FY 2004**	**FY 2005**
Conduct of R&D (Operating Expenses):				
1412 Basic Research	B.A.	$0	$0	$0
	Obs.	0	0	0
	B.O.	0	0	0
1422 Applied Research	B.A.	$0	$0	$0
	Obs.	0	0	0
	B.O.	0	0	0
1429 Total Research	B.A.	$0	$0	$0
	Obs.	0	0	0
	B.O.	0	0	0
1432 Development	B.A.	$0	$0	$0
	Obs.	17,579	58,041	0
	B.O.	23,424	52,040	0
1439 Total Operating Expenses – R&D	B.A.	$0	$0	$0
	Obs.	17,579	58,041	0
	B.O.	23,424	42,040	0
Physical Assets: Not applicable				
Grant Total R&D and Facilities	B.A.	$0	$0	$0
	Obs.	17,579	58,041	0
	B.O.	23,424	52,040	0
Memorandum (non-add) R&D Entries:				
Conduct of R&D performed by Colleges and Universities				
1441 Direct Costs	*B.A.*	*$500*	*$0*	*$0*
		FY 2003	***FY 2004***	***FY 2005***
1442 Indirect Costs	*B.A.*	*$300*	*$0*	*$0*
1439 Total, Colleges and Universities	*B.A.*	*$800*	*$0*	*$0*
Allocation of Research (Not applicable)				

Attached is a recent cost-shared analysis (pp. 85–104) which details those programs where cost-sharing is used as a financing tool. The report covers FY 2002 and FY 2003, however, Fossil Energy R&D activities continuing into FY 2004 and FY 2005 will be cost-shared on a similar basis. The exception will be the Clean Coal Power Initiative which will require cost-sharing participation based on the Clean Coal Technology statutory language which brings with it mandatory 50 percent cost-sharing, repayment, and a few other tags specific to the Clean Coal Technology Program.

Carbon Sequestration Program

Q3. The Office of Fossil Energy's Carbon Sequestration Roadmap shows a goal on page 6 of "By 2012, develop to the point of commercial deployment systems for direct capture and sequestration of greenhouse gas emissions from fossil fuel conversion processes that protect human and ecosystem health and result in less than a 10 percent increase in the cost of energy services, net of any value-added benefits." Page 21 of the same document shows a planned funding stream of around $50 million per year "with slightly more for 2006 to 2010." However, the FutureGen project plan shows over $86 million in funding from the base sequestration program from 2009 to 2012. Will the goals of the base sequestration research program still be met, even though funds will be used for FutureGen?

A3. Yes, the goals of the base carbon sequestration research program will still be met. In fact, the FutureGen project is very important to the attainment of the sequestration goals.

Carbon sequestration will be one of the primary features that will set the FutureGen plant apart from the other electric power projects. Engineers will design into the plant advanced capabilities to capture the carbon dioxide. No other electricity power plant in the world has been built with this capability.

Once captured, carbon dioxide will be injected deep underground, into brackish reservoirs that lay thousands of feet below the surface of much of the United States, or into oil or gas reservoirs, or into unmineable coal seams or volcanic basalt formations. Once entrapped in these formations, the greenhouse gas would be permanently isolated from the atmosphere.

The project will seek to sequester carbon dioxide emissions at an operating rate of one million metric tons or more of carbon dioxide sequestered per year. We will work with the appropriate domestic and international communities to establish standardized technologies and protocols for carbon dioxide measuring, monitoring, and verification.

The FutureGen plant will pioneer carbon sequestration technologies tied to power plants on a scale that will help determine whether this approach to 21st century management is viable and affordable.

Q4. The FutureGen project plan shows $480 million for the procurement and construction of the coal gasification power plant. At 270 megawatts (Mw), that works out to over $1750 per installed kilowatt. The PART for Clean Coal Research states "Optimized designs [for advanced clean coal power plants] are about $1250–1300/kW." Why is the power plant component of FutureGen 37 percent more expensive?

A4. The $1250–1300/kW IGCC cost is for mature commercial plants. The FutureGen plant will employ first-of-a-kind technologies. It will be configured to coproduce electricity and hydrogen, and be integrated with carbon sequestration. The coal gasification unit will be integrated with both a hydrogen production module and a hydrogen combustion turbine. Additionally, FutureGen will likely have much more instrumentation than a conventional power plant, which will also increase the overall cost. As a result of these requirements, the cost of the "power block" per kilowatt of the FutureGen plant will exceed that of a conventional power plant design.

Q5. Previous clean coal projects that built power plants had cost-sharing from industry as high as 67 percent. Your budget documentation says that demonstration portions of FutureGen will be cost-shared at a minimum of 50 percent from industry, yet in years when the base plant is the bulk of the budget (e.g., 2008), DOE's share is at 69 percent. Will DOE cost-share the power plant demonstration portion at 50 percent as outlined in the budget or at the higher rates outlined in the plan?

A5. The planned cost-share profile will follow the proportion as outlined in the FutureGen plan to Congress. Direct funding from the existing industry consortium is expected to be $250 million and represents 26 percent of the overall $950 million project cost projection (in FY 2004 dollars); DOE will use its best efforts to achieve or exceed a minimum 80/20 industry cost share for the $120 million in sequestration R&D.

Fossil Energy R&D and CCT
FY02 & FY03 Cost-Shared Analysis

March 2004

FY 2002 & FY 2003
FE R&D and Clean Coal Technology - Cost-Shared Analysis

TABLE OF CONTENTS

FOSSIL ENERGY RESEARCH AND DEVELOPMENT

FY 2003	Page #
• Graph - Fossil Energy R&D FY 2003 Cost-Shared vs. Non Cost-Shared Contracts	1
• Graph - Fossil Energy R&D FY 2003 Cost-Shared Contracts - Government Share vs. Awardee Share	2
• Graph - Fossil Energy R&D FY 2003 Cost-Shared Contracts - By Program Area	3
• Graph - Coal Program by Activity - Fossil Energy R&D FY 2003 Cost-Shared Contracts	4
• Graph - Petroleum Program by Activity - Fossil Energy R&D FY 2003 Cost-Shared Contracts	5
• Graph - Gas Program by Activity - Fossil Energy R&D FY 2003 Cost-Shared Contracts	6
• Diagram - (Cost-Shared Definitions) Office of Fossil Energy FY 2002 & FY 2003 Cost-Shared Contracts	7
• FY 2003 Fossil Energy R&D Cost-Shared Contracts Summary	8
• FY 2003 Fossil Energy R&D Cost-Shared Contracts Listing	9-20
FY 2002	
• Graph - Fossil Energy R&D FY 2002 Cost-Shared vs. Non Cost-Shared Contracts	21
• Graph - Fossil Energy R&D FY 2002 Cost-Shared Contracts - Government Share vs. Awardee Share	22
• Graph - Fossil Energy R&D FY 2002 Cost-Shared Contracts - By Program Area	23

TABLE OF CONTENTS (Cont.)

- Graph - Coal Program by Activity - Fossil Energy R&D FY 2002 Cost-Shared Contracts 24
- Graph - Petroleum Program by Activity - Fossil Energy R&D FY 2002 Cost-Shared Contracts 25
- Graph - Gas Program by Activity - Fossil Energy R&D FY 2002 Cost-Shared Contracts 26
- FY 2002 Fossil Energy R&D Cost-Shared Contracts Summary 27
- FY 2002 Fossil Energy R&D Cost-Shared Contracts Listing 28-38

CLEAN COAL TECHNOLOGY

FY 2003

- Graph - Clean Coal Technology FY 2003 Cost-Shared Contracts 39
- FY 2003 Clean Coal Technology Cost-Shared Contracts Listing 40

FY 2002

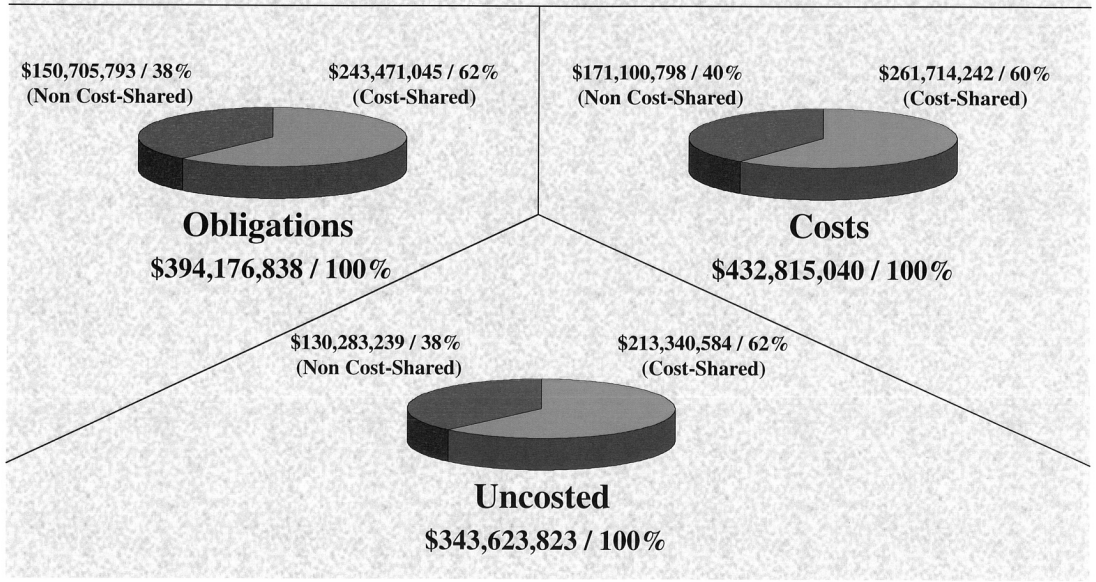
- Graph - Clean Coal Technology FY 2002 Cost-Shared Contracts 41
- FY 2002 Clean Coal Technology Cost-Shared Contracts Listing 42

FY 2003 Cost-Shared Contracts
Fossil Energy R&D

Fossil Energy R&D (89x0213)

FY 2003 Cost-Shared vs. Non Cost-Shared Contracts

(as of 09/30/03)



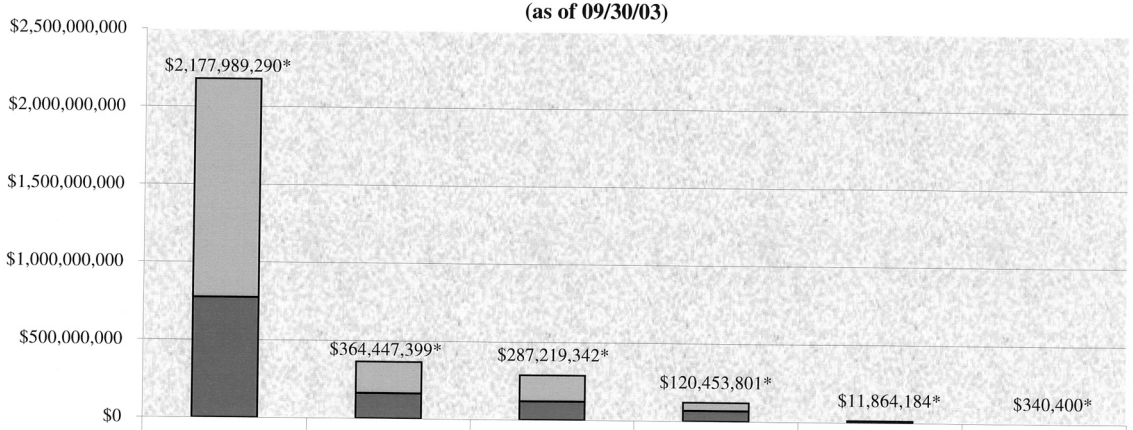
- Financial Data (Obligations, Costs, Uncosted) taken from FDW and excludes B&Rs AD, AN, & AU

Fossil Energy R&D (89x0213)

FY 2003 Cost-Shared Contracts

Government Share vs. Awardee Share

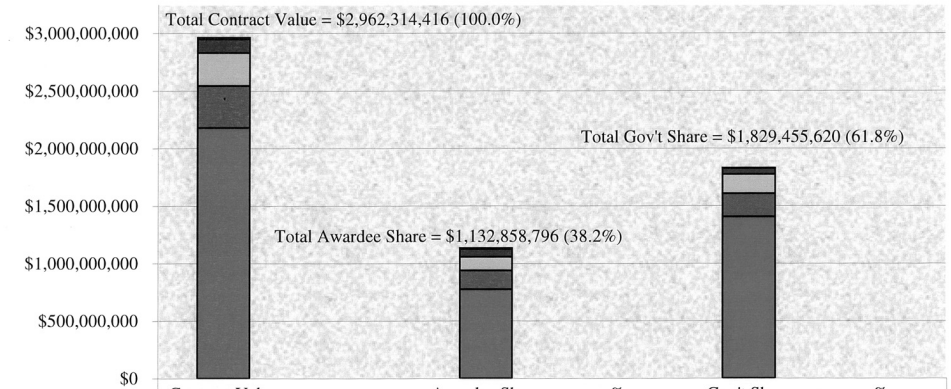
(as of 09/30/03)



	COAL	PETROLEUM	GAS	COOP. R&D	FE ENV. RESTOR.	CLEAN COAL PWR INIT.
Govt Share	64.5%	55.3%	58.5%	43.5%	29.5%	87.0%
	$1,403,770,823	$201,599,681	$167,947,706	$52,341,552	$3,499,858	$296,000
Awardee Share	35.5%	44.7%	41.5%	56.5%	70.5%	13.0%
	$774,218,467	$162,847,718	$119,271,636	$68,112,249	$8,364,326	$44,400

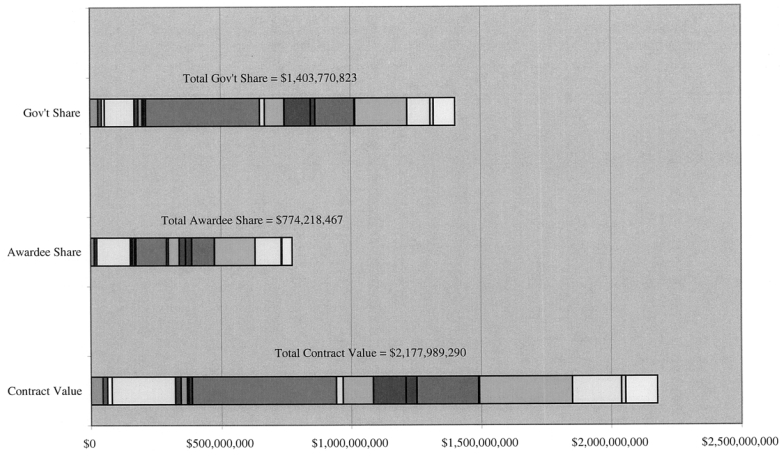
*Denotes the sum of all Cost-Shared Contracts ("Total Contract Value") for each Fossil Energy R&D Program Area

Fossil Energy R&D (89x0213)
FY 2003 Cost-Shared Contracts
By Program Area
(as of 09/30/03)



	Contract Value	Awardee Share	%	Gov't Share	%
CLEAN COAL PWR INIT.	$340,400	$44,400	13.0%	$296,000	87.0%
FE ENVIR. RESTOR.	$11,864,184	$8,364,326	70.5%	$3,499,858	29.5%
COOP. R&D	$120,453,801	$68,112,249	56.5%	$52,341,552	43.5%
GAS	$287,219,342	$119,271,636	41.5%	$167,947,706	58.5%
PETROLEUM	$364,447,399	$162,847,718	44.7%	$201,599,681	55.3%
COAL	$2,177,989,290	$774,218,467	35.5%	$1,403,770,823	64.5%

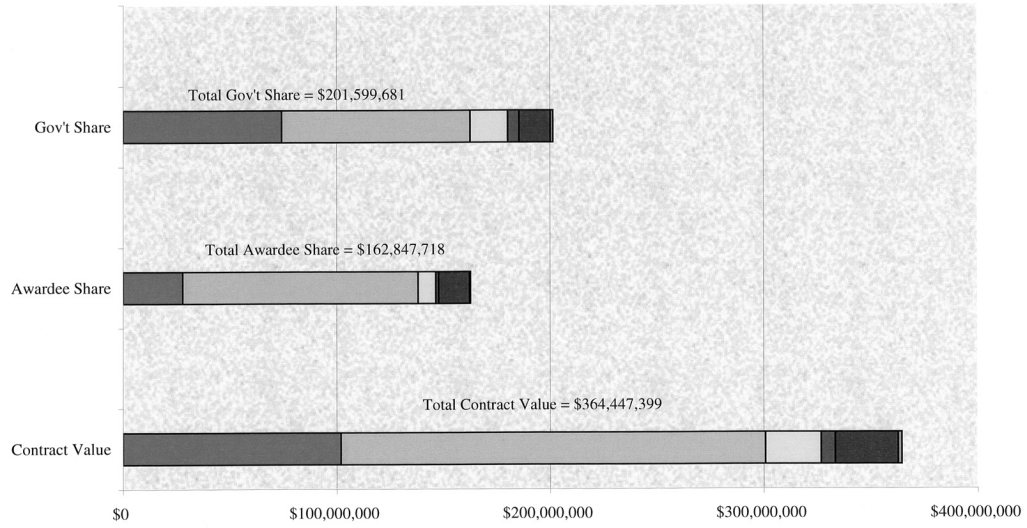
FY 2003 Cost-Shared Contracts
Coal Program by Activity (as of 09/30/03)



	Contract Value	Awardee Share	%	Gov't Share	%
Greenhouse Gas Control	$123,240,925	$39,606,666	32.1%	$83,634,259	67.9%
Novel Generation	$15,652,063	$2,875,079	18.4%	$12,776,984	81.6%
Vision 21 Hybrids	$188,912,345	$100,390,300	53.1%	$88,522,045	46.9%
Innovative Concepts	$357,447,031	$156,447,666	43.8%	$200,999,365	56.2%
Advanced Research	$2,914,530	$668,530	22.9%	$2,246,000	77.1%
Fuel Cell Sys.	$237,944,646	$86,875,603	36.5%	$151,069,043	63.5%
Power Plant Imprve Init.	$41,198,311	$23,782,387	57.7%	$17,415,924	42.3%
Turbines	$125,799,446	$24,214,313	19.2%	$101,585,133	80.8%
Innov. For Exist. Plants	$117,010,686	$41,768,781	35.7%	$75,241,905	64.3%
Adv. Sys. Combust. Sys.	$25,795,965	$6,726,836	26.1%	$19,069,129	73.9%
Adv. Sys. IGCC	$554,515,316	$117,186,206	21.1%	$437,329,110	78.9%
Adv. Sys. Ind. Fired Cycle	$13,078,363	$4,676,375	35.8%	$8,401,988	64.2%
Univ./Nat. Lab.Coal Res.	$4,397,969	$1,166,457	26.5%	$3,231,512	73.5%
Tech. Crosscut.	$1,669,925	$446,566	26.7%	$1,223,359	73.3%
Mat. & Comp.	$23,908,955	$7,652,461	32.0%	$16,256,494	68.0%
Coal Util. Sci.	$21,420,058	$6,668,922	31.1%	$14,751,136	68.9%
Transport. Fuels & Chem	$242,277,003	$128,514,000	53.0%	$113,763,003	47.0%
Steelmaking	$17,833,874	$6,989,364	39.2%	$10,844,510	60.8%
Advanced Fuels Research	$17,563,301	$3,642,920	20.7%	$13,920,381	79.3%
Solid Fuels & Feedstocks	$45,408,578	$13,919,035	30.7%	$31,489,543	69.3%

FY 2003 Cost-Shared Contracts

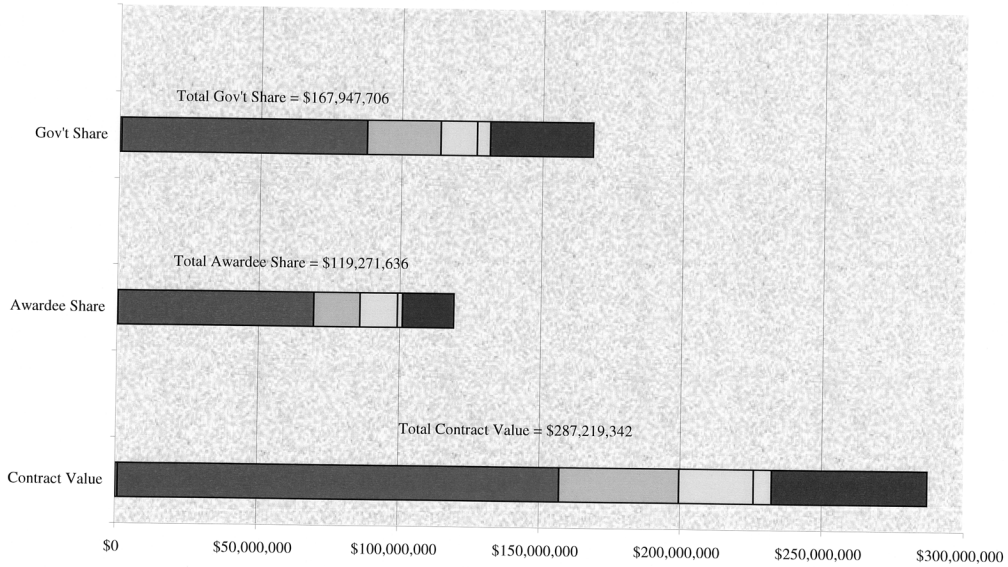
Petroleum Program by Activity (as of 09/30/03)



	Contract Value	Awardee Share	%	Gov't Share	%
Oil Shale Tech. Base	$1,825,952	$550,952	30.2%	$1,275,000	69.8%
Ultra Clean Fuels	$29,198,004	$14,501,304	49.7%	$14,696,700	50.3%
Emerging Processing Tech.	$6,618,844	$1,323,769	20.0%	$5,295,075	80.0%
Effective Envir. Protect.	$26,007,114	$8,337,306	32.1%	$17,669,808	67.9%
Reservoir Life Ext./Mgmt	$198,855,744	$110,361,871	55.5%	$88,493,873	44.5%
Exploration & Production	$101,941,741	$27,772,516	27.2%	$74,169,225	72.8%

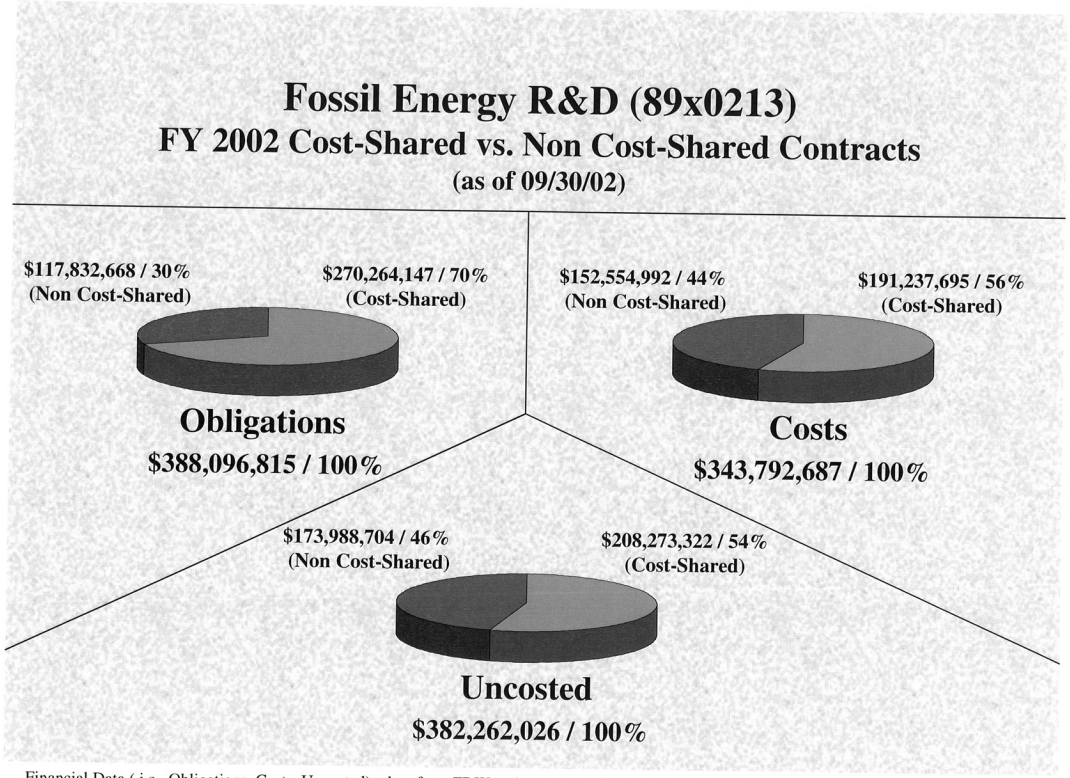
FY 2003 Cost-Shared Contracts

Gas Program by Activity (as of 09/30/03)



	Contract Value	Awardee Share	%	Gov't Share	%
Gas Hydrates	$54,916,681	$18,322,968	33.4%	$36,593,713	66.6%
Effective Envir. Protect.	$6,344,595	$1,749,977	27.6%	$4,594,618	72.4%
Emerg. Proc. Tech. Apps.	$26,246,141	$13,329,936	50.8%	$12,916,205	49.2%
Infrastructure	$42,507,492	$16,345,526	38.5%	$26,161,966	61.5%
Exploration & Production	$156,250,349	$69,237,004	44.3%	$87,013,345	55.7%
Eastern Gas Shales	$954,084	$286,225	30.0%	$667,859	70.0%

FY 2002 Cost-Shared Contracts
Fossil Energy R&D



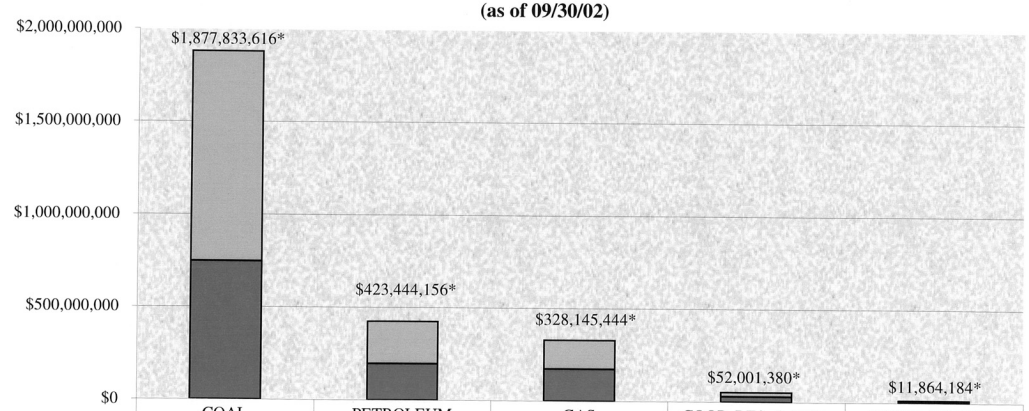
- Financial Data (i.e., Obligations, Costs, Uncosted) taken from FDW and excludes B&Rs AD, AN, & AU

Fossil Energy R&D (89x0213)

FY 2002 Cost-Shared Contracts

Government Share vs. Awardee Share

(as of 09/30/02)



	COAL	PETROLEUM	GAS	COOP. RES. & DEV.	ENVIR. RESTOR.
Govt Share	60.2%	53.7%	47.5%	43.7%	29.5%
	$1,131,024,491	$227,566,676	$155,724,562	$22,740,000	$3,499,858
Awardee Share	39.8%	46.3%	52.5%	56.3%	70.5%
	$746,809,125	$195,877,480	$172,420,882	$29,261,380	$8,364,326

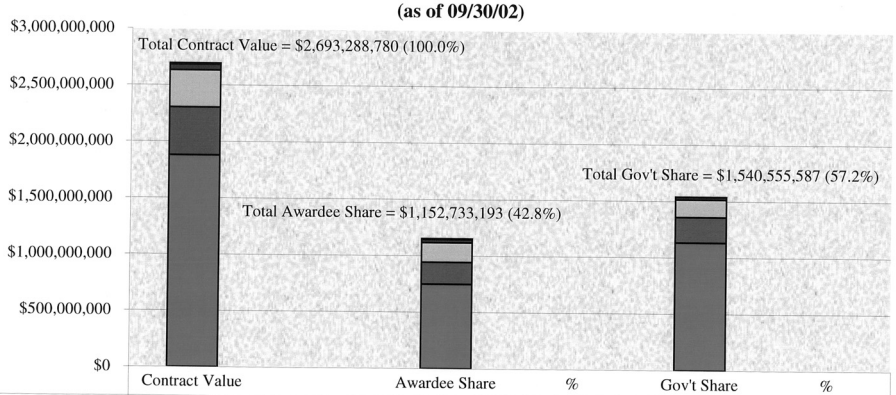
*Denotes the sum of all Cost-Shared Contracts ("Total Contract Value") for each Fossil Energy R&D Program Area

Fossil Energy R&D (89x0213)

FY 2002 Cost-Shared Contracts

By Program Area

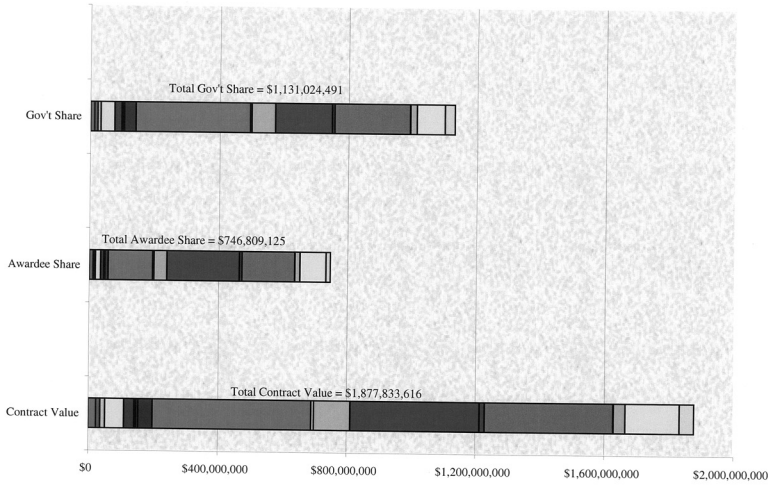
(as of 09/30/02)



	Contract Value	Awardee Share	%	Gov't Share	%
ENVIR. RESTOR.	$11,864,184	$8,364,326	70.5%	$3,499,858	29.5%
COOP. RES. & DEV.	$52,001,380	$29,261,380	56.3%	$22,740,000	43.7%
GAS	$328,145,444	$172,420,882	52.5%	$155,724,562	47.5%
PETROLEUM	$423,444,156	$195,877,480	46.3%	$227,566,676	53.7%
COAL	$1,877,833,616	$746,809,125	39.8%	$1,131,024,491	60.2%

FY 2002 Cost-Shared Contracts

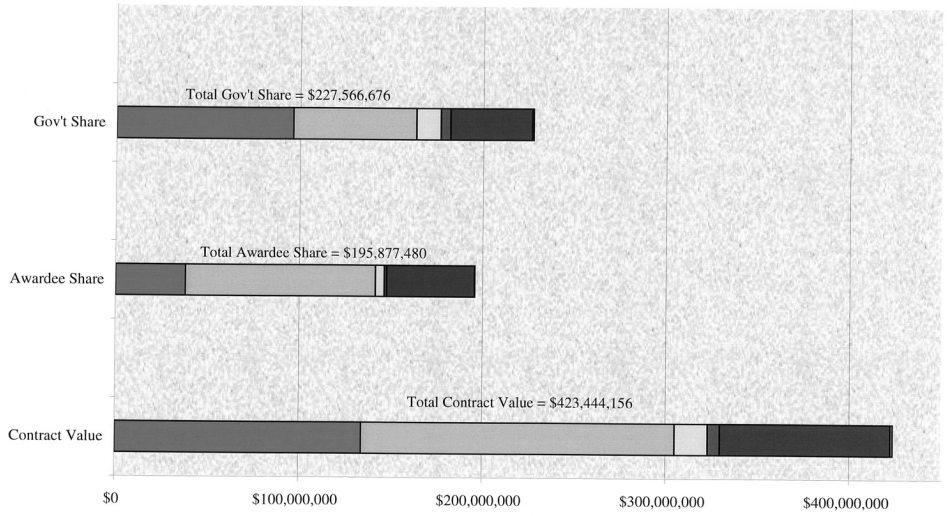
Coal Program By Activity (As of 09/30/02)



	Contract Value	Awardee Share	%	Gov't Share	%
Greenhouse Gas Control	$44,781,462	$13,815,463	30.9%	$30,965,999	69.1%
Vision 21 Hybrids	$168,074,799	$80,610,712	48.0%	$87,464,087	52.0%
Innovative Concepts	$36,066,660	$16,003,272	44.4%	$20,063,388	55.6%
Advanced Research	$1,605,393	$345,393	21.5%	$1,260,000	78.5%
Fuel Cell Sys.	$398,195,626	$163,540,146	41.1%	$234,655,480	58.9%
Power Plant Imprve Init.	$15,734,902	$8,339,304	53.0%	$7,395,598	47.0%
Adv. Turbine Sys.	$401,930,139	$225,295,315	56.1%	$176,634,824	43.9%
AR&ET(Clean Fuels)	$113,133,762	$39,806,960	35.2%	$73,326,802	64.8%
High Effcy PFB	$8,372,702	$3,618,902	43.2%	$4,753,800	56.8%
High Effcy IGCC	$492,301,529	$137,655,637	28.0%	$354,645,892	72.0%
Ind. Fired Cycle.	$44,650,126	$9,513,665	21.3%	$35,136,461	78.7%
Univ./Nat. Lab.Coal Res.	$5,371,117	$1,391,535	25.9%	$3,979,582	74.1%
Tech. Crosscut.	$3,739,344	$1,017,885	27.2%	$2,721,459	72.8%
Mat. & Comp.	$2,120,099	$1,086,763	51.3%	$1,033,336	48.7%
Coal Util. Sci.	$32,041,382	$9,821,260	30.7%	$22,220,122	69.3%
Transport & Fuels	$58,164,648	$15,651,967	26.9%	$42,512,681	73.1%
Steelmaking	$14,732,316	$5,235,927	35.5%	$9,496,389	64.5%
AR&ET(PFB)	$13,139,846	$2,709,050	20.6%	$10,430,796	79.4%
Coal Prep.	$23,677,764	$11,349,969	47.9%	$12,327,795	52.1%

FY 2002 Cost-Shared Contracts

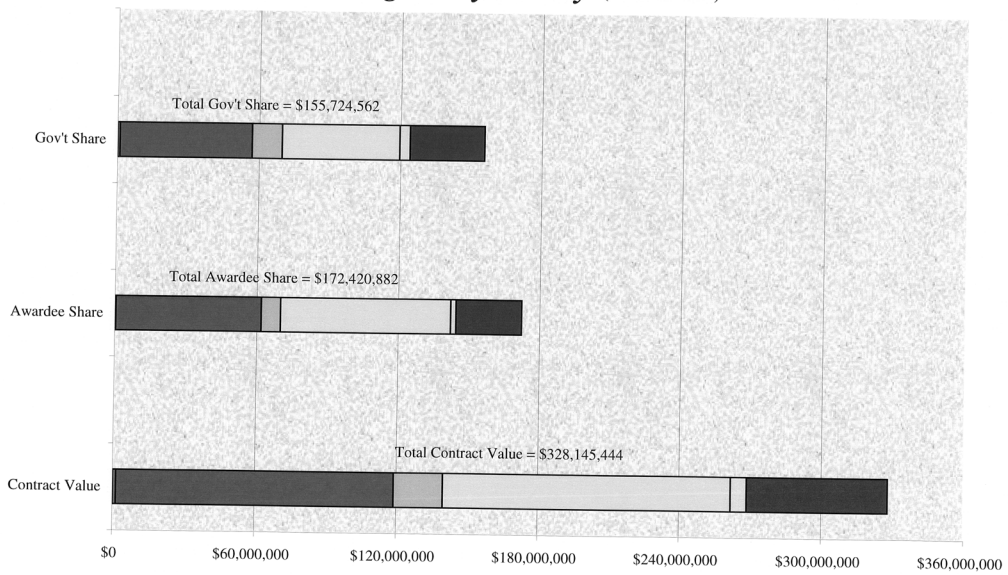
Petroleum Program by Activity (as of 09/30/02)



	Contract Value	Awardee Share	%	Gov't Share	%
Oil Shale Tech. Base	$1,267,308	$367,308	29.0%	$900,000	71.0%
Ultra Clean Fuels	$92,488,033	$47,773,141	51.7%	$44,714,892	48.3%
Emerging Processing Tech.	$6,618,844	$1,323,769	20.0%	$5,295,075	80.0%
Effective Envir. Protect.	$18,029,211	$4,781,899	26.5%	$13,247,312	73.5%
Recovery Field Demos	$170,848,019	$103,711,346	60.7%	$67,136,673	39.3%
Exploration & Production	$134,192,741	$37,920,017	28.3%	$96,272,724	71.7%

FY 2002 Cost-Shared Contracts

Gas Program by Activity (as of 09/30/02)

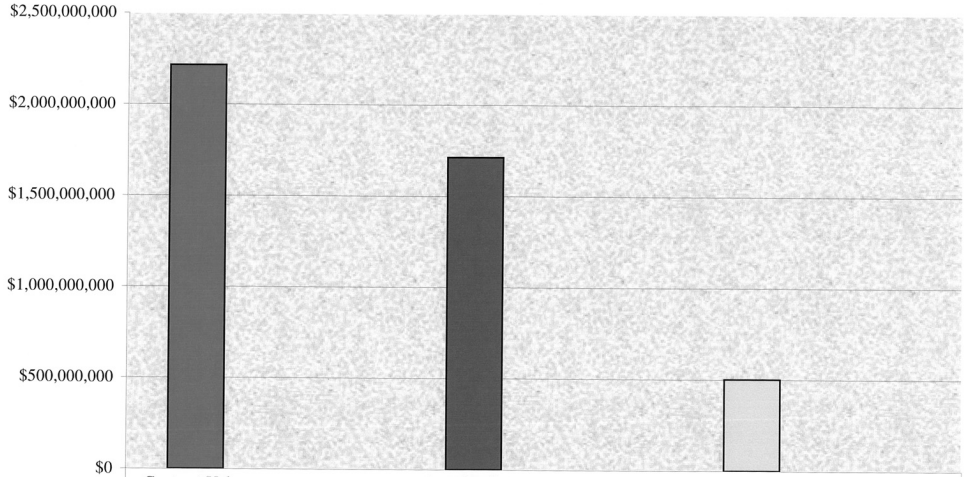


	Contract Value	Awardee Share	%	Gov't Share	%
Gas Hydrates	$59,629,049	$27,862,476	46.7%	$31,766,573	53.3%
Effective Envir. Protect.	$6,674,030	$2,288,174	34.3%	$4,385,856	65.7%
Emerg. Proc. Tech. Apps.	$122,038,558	$72,138,433	59.1%	$49,900,125	40.9%
Infrastructure	$20,869,641	$8,169,669	39.1%	$12,699,972	60.9%
Exploration & Production	$117,559,664	$61,549,780	52.4%	$56,009,884	47.6%
Eastern Gas Shales	$1,374,502	$412,350	30.0%	$962,152	70.0%

FY 2003 & FY 2002 Cost-Shared Contracts
Clean Coal Technology

Clean Coal Technology
FY 2003 Cost-Shared Contracts

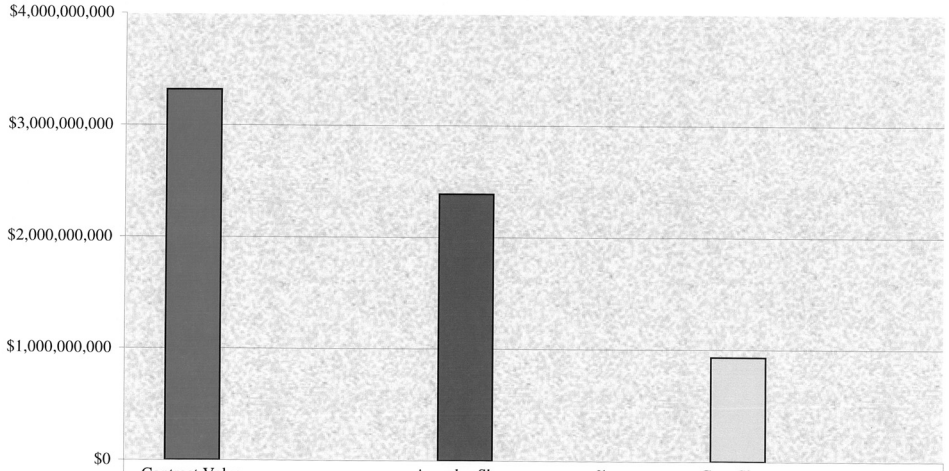
(as of 09/30/03)



	Contract Value	Awardee Share	%	Govt Share	%
FY2003 Total	$2,214,480,202	$1,713,136,524	77.4%	$501,343,678	22.6%

Clean Coal Technology
FY 2002 Cost-Shared Contracts

(as of 09/30/02)



	Contract Value	Awardee Share	%	Govt Share	%
FY2002 Total	$3,317,011,578	$2,385,241,986	71.9%	$931,769,592	28.1%

ANSWERS TO POST-HEARING QUESTIONS

Responses by William D. Magwood, IV, Director of the Office of Nuclear Energy, Science, and Technology, U.S. Department of Energy

Questions submitted by Chairman Judy Biggert

Q1. What portion of your budget goes to R&D activities? What is the mix of basic research, applied research, development activities, and demonstration within Nuclear Energy's budget in fiscal year 2004 and 2005? What are the other activities that NE is engaged in, and how do they match with the Research and Development Investment Criteria? Please provide the level of industry cost-sharing in each category of program. For the activities that are not research, development or demonstration, please outline the relative roles of the Federal Government and that of the industry.

A1. The portion of the total Nuclear Energy budget that is research and development is 32 percent in FY 2004 and 23 percent in FY 2005.

The following table provides the mix of research and development funding for FY 2004 and FY 2005. At this time, the Office of Nuclear Energy, Science and Technology does not have any funding which falls into the categories of basic research or demonstration.

	($ in thousands)	
	FY 2004 Adj. Approp.	FY 2005 Request
APPLIED RESEARCH		
Nuclear Energy Research Initiative	6,592	0
Nuclear Energy Plant Optimization	2,013	0
Generation IV Nuclear Energy Systems Initiative	27,744	30,546
Nuclear Energy Technologies	0	0
Nuclear Hydrogen Initiative	6,377	9,000
Advanced Fuel Cycle Initiative	56,000	42,000
TOTAL APPLIED RESEARCH	98,726	81,546
DEVELOPMENT		
Nuclear Energy Technologies	19,622	10,246
Nuclear Energy Plant Optimization	930	0
Advanced Fuel Cycle Initiative	3,000	2,000
TOTAL DEVELOPMENT	23,552	12,246
TOTAL RESEARCH & DEVELOPMENT	122,278	93,792

The remainder of the NE budget is dedicated to university assistance and to managing the planning, acquisition, operation, maintenance, and disposition of nuclear facilities and infrastructure to meet the growing demand for isotopes used in medicine, scientific research and homeland security; provide radioisotope power systems for space exploration and national security; and assure the long-term future of the domestic nuclear fuel supply. These infrastructure activities are conducted in accordance with DOE Order 430.1B, *Real Property Asset Management.* Although many of these activities support our nuclear energy research and development programs, they are not evaluated against the Research and Development Investment Criteria, since there is no such requirement.

The U.S. Generation IV Nuclear Energy Systems Initiative is conducted in cooperation with the international community. Through this collaboration, we are sharing in the results of the R&D conducted by our Generation IV International Forum (GIF) partners, effectively leveraging our R&D investment. The Department of Energy (DOE) is supporting the research, development, and design work for a

Generation IV nuclear power plant that represents a significant advance over existing energy production technologies in terms of sustainability, safety and reliability, economics, proliferation resistance and physical protection. The Department is working with its international partners in the Generation IV International Forum to identify research and development activities that could enable such a technology to be demonstrated in pilot form before 2020. The details of the cost share are yet to be worked out. An Expression of Interest for this initiative is being prepared for release this spring.

On the Nuclear Power 2010 program, industry is contributing $18.6 million in FY 2004. In FY 2005, the industry contribution is expected to exceed $8 million.

In FY 2004, industry is contributing $1.7 million for Nuclear Energy Plant Optimization program activities. No federal funding is requested for this program in FY 2005.

In the University Reactor Infrastructure and Education Assistance program, the joint DOE/Industry Matching Grants Program provides funds to universities for scholarships, improving nuclear engineering and science curricula, and modernizing experimental and instructional facilities. In FY 2004, industry is contributing $800,000 for this program, and in FY 2005, industry is expected to contribute $1 million. The Department matches the funding provided by industry for this program.

With the exception of the DOE/Industry Matching Grants program, the nuclear energy activities that are not research, development or demonstration are managed and funded by the Federal Government. Industry has no active role in these programs.

Q2. The President's Management Agenda (PMA) includes government-wide provisions on budget and performance integration that have been implemented through the Program Assessment and Rating Tool (PART). How do these activities dovetail with the reporting requirements of the Government Performance and Results Act of 1993? What specific steps is the program taking to avoid duplication of effort for these data collection efforts?

A2. To avoid duplication of effort, the data developed and/or collected to meet Government Performance and Results Act (GPRA) planning, program execution, reporting and accountability requirements is also used to respond to President's Management Agenda (PMA) achievement and accountability requirements. Duplication is further avoided by using the identical management chain for both taskings. The GPRA unit multi-year program plans explain in more detail how the program activities over the next 10–15 years will support the Department's Strategic Plan. Each Departmental program defines a major activity or group of activities that support the core mission of the Department and thus provide a means of establishing a concrete link between the Strategic Plan's goals and the Department's annual budget, performance metrics, and performance reporting. The content of the program plans is used to both populate the annual budget and substantiate the PART document—both of which inform the budget and decision-making processes, by focusing management on planning and priority setting, prior to the review of the budget. The performance data collected for the Department's annual Performance and Accountability Report is used to substantiate the PART document as well.

Q3. Your testimony stated that the Nuclear Energy Research Initiative (NERI), which has funded peer-reviewed nuclear research at universities, will be integrated into your mainstream R&D programs, including Generation IV, Nuclear Hydrogen, and the Advanced Fuel Cycle Institutive. What fraction of the funds allocated to each of these programs will be set aside for peer-reviewed, university-based research?

A3. The total funding set aside for FY 2005 peer-reviewed, university-based research is $7 million. The set-aside for the Generation IV Nuclear Energy Systems Initiative is $3.5 million, 11 percent of the requested funding for the program. The set-aside for the Nuclear Hydrogen Initiative is $900,000, 10 percent of the requested funding. The set-aside for the Advanced Fuel Cycle Initiative is $2.6 million, 6 percent of the requested funding.

Q4. The Idaho National Environmental and Engineering Laboratory (INEEL) has made significant investments in research and development programs in environmental science, biomass and biorefinery systems, energy conservation, fossil energy, and vehicle technologies. Will the new Idaho National Laboratory retain a similar level of commitment to these programs? If no, please explain, for each of these areas, why the Department has decided to de-emphasize the area in the laboratory's future work.

A4. The Idaho National Laboratory will be a multi-program laboratory. The statement of work in the draft Idaho National Laboratory (INL) Request for Proposals (RFP) is broadly worded and will allow for virtually any scientific or technological endeavor. For example, one subparagraph in the statement of work specifically includes biological sciences, earth sciences, physics, chemical sciences, material sciences, fusion science, modeling and simulation, and computational sciences as areas of work to be supported and improved upon by the contractor. The extent to which any particular area of research is pursued will depend upon the availability of funding, the importance of the work, and the availability of qualified people and facilities suitable to safely perform the work.

ANSWERS TO POST-HEARING QUESTIONS

Responses by James W. Glotfelty, Director of the Office of Electric Transmission and Distribution, U.S. Department of Energy

Questions submitted by Chairman Judy Biggert

Q1. What impacts do you expect the reduction in the energy storage account to have on the likely contribution of intermittent sources (such as wind—the fastest growing power source on a percentage basis) that are being connected to the grid in response to state renewable portfolio standards?

A1. Energy storage technologies can improve the quality, reliability, flexibility and cost effectiveness of the existing electric system, and will continue to play an integral part in the research and development portfolio of the Office of Electric Transmission and Distribution (OETD). Uncontrollably dumping large amounts of power onto the grid can impose power quality issues that utilities must address. Storage is a solution that supports the growing contribution from intermittent, undispatchable sources, and the lack of storage technologies could delay extensive, cost-effective deployment of renewables. The reduction from FY 2004 to FY 2005 is due to $6.9 million of Congressionally directed projects that are not being requested in FY 2005. Without the Congressionally directed projects, the FY 2005 program directed request of $4.0 million represents an increase of $1.9 million over the $2.1 million allocated in FY 2004. Most of the current storage projects focus on addressing critical issues with grid reliability; an expanded storage program could include more projects that emphasize the positive impact of storage on the contribution of intermittent sources to the generation portfolio.

Q2. Using the definitions in OMB Circular A–11, what is the proposed mix of funding in the fiscal year 2005 budget request between basic research, applied research, development, demonstration, and deployment activities for your office? Please provide the comparable fiscal year 2004 numbers for comparison.

A2. For applied research, we funded $25.497 million in FY 2004 and have requested $28.362 million in FY 2005 (primarily for High Temperature Superconductivity R&D). For development, we funded $39.428 million in FY 2004 and have requested $57.518 million FY 2005 (which includes the Transmission Reliability, Electric Distribution Transformation and Storage Activities). For demonstrations, we funded $3.671 in FY 2004 (which was entirely Congressionally Directed Activities, although some earmarks also fell into the "Applied Research," "Development," and "Deployment" categories) and have not requested any money in FY 2005. For deployment, we funded $12.222 million in FY 2004 and have requested $5 million in FY 2005 ($5 million in FY 2004 funded DOE's work in connection with the investigation of the August 14, 2003, blackout; both years include funding for the Electricity Restructuring Activity).

Questions submitted by Representative Lincoln Davis

Q1. The FY05 request states, "EREL will help the Office of Electricity Transmission and Distribution develop an electric grid that is secure from physical and cyber terrorism, has the flexibility to incorporate both central and distributed generation, has the embedded intelligence to manage power flows under normal and emergency circumstances, and that meets the Nation's growing needs for increased transmission capacity and power quality, at an affordable cost." But two pages later, "Project engineering and design is delayed in FY 2005 to allow OETD to focus on higher level priority activities. PED will resume in FY 2006." It seems to me that EREL will address high level priorities and the sooner it is completed the better. Can you comment?

A1. OETD has postponed the design and construction of the Energy Reliability and Efficiency Laboratory (EREL) from FY 2005 to FY 2006 in order to focus its resources on more immediate and critical R&D work related to transmission reliability. As reflected in the President's FY 2005 Budget, EREL is currently on schedule for completion in FY 2009.

Q2. It has also come to my attention that none of the funds appropriated for PED in FY 2004 have been received at ORNL. Can you comment on the delays in funding of this facility?

A2. Funding in the amount of $736 thousand for the entire Project Engineering and Design (PED) was sent to Oak Ridge National Laboratory (ORNL) in the May 2004 Approved Funding Program (AFP).