

**Statement of Dr. John H. Marburger, III
to the
United States House of Representatives
Committee on Science
Fiscal Year 2005 Federal R&D Budget
February 11, 2004**

Mr. Chairman and members of the committee, I am pleased to meet with you today to discuss the President's federal research and development budget for fiscal year 2005.

I have appreciated the close and productive relationship with this Committee and look forward to working with you again this year as we make important choices to optimize Federal R&D investment. Your continued support of our country's research and engineering enterprise is yet another reason why the U.S. Government continues to lead the world in research and development.

The President said in his State of the Union address that "Our greatest responsibility is the active defense of the American people," which includes not only winning the war on terrorism, but also securing the homeland. The President's budget focuses on these important priorities and builds on the economic recovery now underway. The Administration is also determined, however, to control the deficit and reduce it as the economy continues to grow, while ensuring that our national security needs are met. Funding the nation's expanding national and homeland security needs while limiting other budget growth to less than 0.5% will lead to smaller increases for other categories, including some R&D programs.

In my testimony today, I would like to place the President's R&D request in the context of strong support for science and technology in this administration. With the President's FY 2005 budget, total R&D investment during the first term will be increased by 44%, to a record \$132 billion in 2005, compared to \$91 billion in FY 2001. That equates to increases of nearly 10% each year. This Administration understands that science and technology are major drivers of economic growth and important for securing the homeland and winning the war on terrorism. The President's budget, as in years past, continues to emphasize improved management and performance to maintain excellence and sustain our national leadership in science and technology.

In my prepared statement I will review the broad goals of the President's budget and provide an overview of the request for Federal research priorities that cut across multiple agencies and research disciplines.

THE PRESIDENT'S FY 2005 R&D BUDGET

The President's FY 2005 budget request commits 13.5% of total discretionary outlays to R&D, the highest level in 37 years. Not since 1968 during the Apollo program have we seen an investment in research and development of this magnitude. Of this amount, the budget commits 5.7% of total discretionary outlays to non-defense R&D, the third highest level in 25 years.

The programs in the Federal R&D budget continue to build upon exciting areas of scientific discovery from hydrogen energy and nanotechnology to the basic processes of living organisms, the fundamental properties of matter, and a new vision of sustained space exploration. Not all programs can or should receive equal priority, and this budget reflects priority choices consistent with recommendations from numerous expert sources. In particular, this budget responds to recommendations by the President's Council of Advisors on Science and Technology (PCAST) and others about needs in physical science and engineering.

The budget also reflects an extensive process of consultation among the Federal agencies, OMB, and OSTP, to understand thoroughly the agency programs and priorities, interagency collaborations, and directions for the future. The National Science and Technology Council (NSTC) continues to provide a valuable mechanism to facilitate this interagency coordination. This process resulted in guidance to agencies issued by OSTP and OMB last June, concerning their program planning, evaluation, and budget preparation, and culminating in the budget you see before you today.

An important component of this budget is an increase in education and workforce development, which are essential components of all Federal R&D activities and continue to be high priorities for the Administration. As President Bush has stated, "America's growing economy is also a changing economy. As technology transforms the way almost every job is done, America becomes more productive, and workers need new skills."

As in previous years this R&D budget highlights the importance of collaborations among multiple Federal agencies working together on broad themes. I will describe high-priority R&D initiatives for FY2005 in five categories: a cluster of programs fostering innovation, which includes the National Nanotechnology Initiative, Networking and Information Technology, and manufacturing; the hydrogen fuel initiative; space exploration; physical sciences and engineering; and homeland security.

AGENCY BUDGET HIGHLIGHTS

Each agency has an opportunity to describe its own programs. In this testimony I will concentrate on priority programs that cut across agency boundaries. Here I will only give a quick overview of science agency budgets proposed for FY2005.

Department of Defense (DoD):

The Defense Department's FY 2005 R&D budget is almost \$70 billion. This funding helps ensure that our military forces have the tools to protect themselves and our Nation and helps the Nation avoid technological surprise by our adversaries in the future. It provides support for the entire spectrum of R&D, including the longer-term Science and Technology programs, totaling \$10.5 billion for basic and applied research and concept and prototype development, through development of systems and test and evaluation of systems. Development programs include: ballistic missile defense; the Joint Strike Fighter; the next generation destroyer; the Army Future Combat System; and chemical and biological defense systems and technology; to name just a few. A total of \$5.2 billion is provided for basic and applied research, which, for the Department

of Defense, promotes the thinking and experimentation that will form the basis for future generations of systems and capabilities that help deter adversaries from attack or, when deterrence fails, allows us to defeat the attacker. This level is \$225 million, or 5%, more than FY 2001. And when you subtract earmarks out, the 2005 request for basic and applied research funding actually increases by about \$370 million over the appropriated FY 2004 level.

National Institutes of Health (NIH):

Building on the research momentum generated by the fulfillment of the President's commitment to complete the five-year doubling of the NIH budget, the FY 2005 Budget provides \$28.6 billion for NIH, an increase of \$729 million or 2.7% over 2004. Since 2001, the NIH Budget has grown by \$8.2 billion or 40%. The Budget's strong investment in new NIH grants illustrates the Administration's continued commitment to research. The Budget includes 10,393 new grants, 258 more than last year and equal to the highest level ever awarded.

As NIH ushers in the next century of biomedical research, it is beginning to transform our medical research capabilities, such as improving access to state-of-the-art instrumentation and biomedical technologies; developing of specialized animal and non-animal research models; and emphasizing "smart" network connected technologies, computer-aided drug design, gene and molecular therapy development, and bioengineering approaches to decrease health care costs. In addition, the NIH budget continues to support biodefense research by providing \$1.74 billion to accelerate clinical trials, target the development of new therapeutic and vaccine products for agents of bioterrorism, and establish Regional Centers of Excellence in Biodefense and Emerging Infectious Diseases.

National Science Foundation (NSF):

The 2005 Budget provides \$5.75 billion for NSF, a 3% increase over the 2004 enacted level. Since 2001 the NSF budget has increased by 30%.

The budget provides over \$1 billion for NSF programs that emphasize the *mathematical and physical sciences*, including mathematics, physics, chemistry, and astronomy. These programs have increased by 31% since 2001.

NSF participates strongly in this Administration's *cross agency priority programs* in information- and nano-technology, climate science, and education. This budget provides \$761 million for NSF's part in the *National Information Technology R&D* initiative, focusing on long-term computer science research and applications; \$210 million for *climate change science*; and \$305 million for NSF's lead role in the *National Nanotechnology Initiative*, a 20% increase from the 2004 level.

Science and math education is strongly supported in this budget, with funds for 5,500 graduate research fellowships and traineeships, an increase of 1,800 since 2001. Annual stipends in these programs have increased to a projected \$30,000, compared with \$18,000 in 2001.

Science infrastructure funding is provided to initiate construction for the National Ecological Observation Network (NEON), the Scientific Ocean Drilling Vessel, and a set of experiments in fundamental physics called "Rare Symmetry Violating Processes" (RSVP).

Department of Energy (DOE):

The 2005 Budget provides \$8.9 billion for R&D at DOE, a \$1.1 billion (or 14%) increase since 2001.

DOE has the lion's share of the President's *Hydrogen Fuel Initiative* to accelerate the worldwide availability and affordability of hydrogen-powered fuel cell vehicles. This Initiative is proposed at \$228 million – a threefold increase over 2001. For the first time it will include basic research investments in the DOE Office of Science focused on understanding and controlling the chemical and physical interactions of hydrogen with materials.

DOE will also continue its efforts to reduce the cost of *renewable energy technologies*, such as wind, solar, geothermal, and biomass at \$375 million, a 5% increase over current funding. The Budget provides a 3% increase for *nuclear energy R&D*, including \$34 million for the Generation IV Nuclear Energy Systems Initiative to develop next-generation nuclear reactor and fuel cycle technologies that are sustainable, proliferation-resistant, and economical.

Electricity transmission and distribution reliability R&D activities are funded at \$91 million, a 12% increase over 2004. These funds include \$45 million for high temperature superconductivity, \$6 million for the new Gridworks program to support research that will enable power lines to carry more power and better control the flow of electricity to prevent blackouts, and \$5 million for the Gridwise program to improve the communications and control system for the electricity grid.

This budget provides \$3.4 billion for the *Office of Science*, including funding to ensure its continuing leadership in physical science research and its unique research in genomics, climate change, and supercomputing. The fifth and final nanoscience research center will begin construction as part of the Office's \$211 million investment in the National Nanotechnology Initiative, 57% more than four years ago.

Department of Commerce:

The 2005 Budget provides over \$1 billion for R&D at the Department of Commerce.

National Institute of Standards and Technology (NIST) "core" programs receive \$482 million for research and physical improvements at NIST's measurement and standards laboratories. This supports equipment for the Advanced Measurement Laboratory and overdue renovations of facilities. These "core" R&D programs are exceptionally high-leverage activities that foster commercialization of new technologies through the development of measurement tools and methods, and the establishment of industrial standards. In an era of global commerce, strong national standards help to protect the interests of U.S. production by reducing artificial technical barriers to trade. *The Manufacturing Engineering Laboratory*, whose role is to strengthen

manufacturing innovation, is funded at \$30 million, 50% over 2001. I would urge that Congress strongly support these key “competitiveness” R&D activities. Last month's Congressional reduction of \$22 million in these programs goes in the wrong direction.

The 2005 Budget again proposes to terminate the *Advanced Technology Program* (ATP). The Administration believes firmly that other NIST research and development programs are both necessary and more effective in supporting the fundamental scientific understanding and technological needs of U.S.-based businesses, American workers, and the domestic economy.

For the *National Oceanic and Atmospheric Administration* (NOAA), the 2005 Budget provides \$350 million for ongoing research on climate, weather, air quality, and ocean processes, 11% more than 2001. This funding level includes \$19 million for NOAA to expand climate observing capabilities in support of the Administration's recently released Climate Change Science Program (CCSP) Strategic Plan.

National Aeronautics and Space Administration (NASA):

The President has committed the United States to a *sustainable, affordable program of human and robotic exploration of the solar system and beyond*, including a human return to the Moon that will ultimately enable future human exploration of Mars and other destinations. This vision not only sets a course to the planets, but also focuses technology development applicable to society on Earth.

To support this and other NASA missions, the Budget requests \$16.2 billion in FY2005 and \$87 billion over five years, an increase of \$1 billion over the FY 2004 five-year plan. NASA will reallocate \$11 billion within this five-year amount toward new exploration activities. Robotic trailblazers to the Moon will begin in 2008, followed by a human return to the Moon no later than 2020. The pace of exploration will be driven by available resources, technology readiness, and our ongoing experience.

The Budget continues the growth in *space science* with a request for \$4.1 billion in FY2005, an increase of \$1.5 billion, or over 50%, since 2001. This budget supports the next generation of space observatories that will be used to better understand the origin, structure, and evolution of the universe. The budget also initiates new exploration missions to Mars.

The 2005 Budget supports a variety of key research and technology initiatives to enable the space exploration vision. These initiatives include *refocusing U.S. research on the International Space Station* to emphasize understanding and countering the impact of long-duration space flight on human physiology. In addition, the agency will pursue optical communications for increased data rates throughout the solar system, space nuclear power to enable high-power science instruments, advanced in-space propulsion technologies, and systems that enable robots and humans to work together in space.

Although exploration will become NASA's primary focus, the agency will not forsake its important work in improving the nation's aviation system, in education, in earth science, and in fundamental space science.

Department of Transportation (DOT):

The budget provides \$659 million for science at DOT, an increase of \$53 million (9%) over 2004, distributed as follows:

The Federal Highway Administration receives \$429 million to support research, technology and education to improve the quality and safety of the Nation's highway transportation infrastructure with initiatives such as increasing the quality and longevity of roadways, identifying safety improvements and promoting congestion mitigation efforts.

The Federal Aviation Administration receives \$117 million to continue critical safety and capacity research with initiatives such as the Joint Planning and Development Office's planning and development of the next generation air transportation system.

The National Highway Traffic Safety Administration receives \$103 million for R&D in crash worthiness, crash avoidance, and data analysis to help reduce highway fatalities and injuries.

Department of Homeland Security (DHS):

Research and development funding within DHS continues to be a priority with \$1.2 billion in FY 2005, an increase of 15% over FY 2004 enacted. R&D is focused on countering chemical, biological, radiological, nuclear, and other catastrophic threats.

In 2005, the Administration will launch a *biosurveillance initiative* that includes \$274 million for integrated monitoring of human health, food, agriculture and the environment. This plan includes \$118 million for the expansion of the BioWatch program and \$11 million to enable the Department of Homeland Security to integrate widely collected biosurveillance data in real-time.

The Budget includes \$60 million to continue research and development of *countermeasures to protect commercial aircraft* against man portable air defense systems (MANPADS).

The President's budget also funds the *Homeland Security Scholars and Fellows program* that provides scholarships to students pursuing scientific studies in homeland security, and the *Homeland Security Centers of Excellence (HS-Centers)* program, a coordinated university-based system to enhance the Nation's homeland security.

PRIORITY INITIATIVES

The 2005 budget highlights high priority inter-agency initiatives described briefly below. These initiatives are coordinated through the National Science and Technology Council (NSTC) for which my office has responsibility for day-to-day operations. The Council prepares research and development strategies that cross agency boundaries to form a consolidated and coordinated investment package.

Innovation – The FY 2005 Budget calls for research and development investments to promote technological innovation in high-priority areas including nanotechnology, information technology and manufacturing; the creation of incentives for increased private sector R&D funding; and stronger intellectual property protections. These investments will stimulate innovation and enhance U.S. competitiveness.

- *Nanotechnology.* The President’s Budget includes \$1 billion in funding to increase understanding, and develop applications based upon, the unique properties of matter at the nanoscale – that is, at the level of clusters of atoms and molecules. Funding for nanotechnology R&D has more than doubled since 2001.
- *Networking and Information Technology.* Since 2001, funding for networking and information technology R&D has increased by 14 percent to over \$2 billion, and the R&D funded by this effort has laid the foundation for many of the technological innovations that have driven this sector forward. The President’s FY 2005 Budget sustains this significant investment.
- *Manufacturing Technology.* The President’s Budget requests increased funding for a number of programs that strengthen manufacturing innovation, including those within the National Science Foundation’s Design, Manufacture and Industrial Innovation Division—up 27 percent since 2001 to \$66 million—and the Manufacturing Engineering Laboratory at the National Institute of Standards and Technology (NIST)—up 50 percent since 2001 to \$30 million. The FY 2005 Budget sustains funding for the Manufacturing Extension Partnership at the 2004 level and proposes to implement reforms to improve the efficiency and effectiveness of the program.

Hydrogen Fuel Initiative – The Hydrogen Fuel Initiative (HFI), announced in the President’s 2003 State of the Union address, seeks to help industry develop practical and cost-effective approaches using hydrogen to power automobiles. HFI focuses on technologies for the production, storage, and delivery of hydrogen, and on the enhancement of fuel cells that promise unusually efficient and clean sources of power. The 2005 Budget for HFI is \$228 million, 43% larger than the amount just enacted for FY 2004.

The 2005 Budget expands fundamental research related to hydrogen fuel technology within the Department of Energy (DOE) Office of Science. Basic research is necessary for improved technologies for hydrogen production, storage, and conversion.

HFI supports research on hydrogen production from renewable energy, coal, nuclear energy, and biomass, safe and effective hydrogen storage systems, and affordable hydrogen fuel cells for consumer automobiles. The Initiative has spurred increased hydrogen technology development efforts among private-sector, state, and international stakeholders.

Physical Sciences and Engineering – Research in the physical sciences and engineering is an essential component of space exploration, nanotechnology, networking and information technologies, biomedical applications, and defense technologies. The President’s 2005 Budget strengthens the nation’s investment in the physical sciences and engineering by making significant investments in these, and other, priority areas.

- *National Science Foundation (NSF).* The President’s Budget provides \$1.1 billion for the Mathematical and Physical Sciences, and proposes significant increases for the

priority areas of nanotechnology (up 20% to \$305 million) and cyberinfrastructure (up 12% to \$399 million).

- *Department of Energy* (DOE). The Budget provides \$3.4 billion for DOE's Office of Science, a \$52 million decrease from FY 2004 enacted. Excluding Congressionally directed projects for 2004 that are not proposed for 2005, the Office of Science budget would *increase* by \$88 million (+2.6%). The Budget includes increases in priority areas such as nanotechnology (up 4% to \$211 million), targeted hydrogen and fuel cell research (+\$21 million), national scientific user facility operations (+\$46 million), and initial funding for the development of an x-ray laser light source that will open entirely new realms of discovery in materials, chemistry, and biology.
- *Department of Commerce* (DOC). The President's Budget includes \$53 million in nanometrology research at NIST.

Homeland Security – Research and development (R&D) funding for homeland security continues to be a priority with an estimated \$3.6 billion in FY2005, tripling the resources dedicated in FY2002, the first budget following the terrorist attacks of September 11, 2001. Research and development is focused on countering chemical, biological, radiological, nuclear, and other catastrophic threats. Priority areas include:

- \$2.5 billion over 3 years for *Project BioShield*, an initiative that encourages the development and procurement of next-generation medical countermeasures against WMD agents.
- \$568 million to improve *food and agriculture defense* through R&D in the U.S. Department of Agriculture, the Department of Health and Human Services and the Department of Homeland Security.
- \$23 million for R&D in EPA for enhanced methods for detecting biological and chemical agents intentionally introduced in drinking water and wastewater systems and methods for safe disposal of waste materials resulting from cleanups.
- \$340 million in the Department of Defense, for R&D to address terrorist and other unconventional threats. Systems and technologies under development to address defense against chemical or biological agents include: improved detectors of chemical and biological threats; troop protective gear for use under chemical and biological attack that is both more effective and more comfortable; and vaccines to protect against biological agents.

MANAGING THE FEDERAL RESEARCH BUDGET

R&D is critically important for keeping our Nation economically competitive, and it will help solve the challenges we face in health, defense, energy, and the environment. As a result, and consistent with the Government Performance and Results Act, every Federal R&D dollar must be invested as effectively as possible.

As directed by the President's Management Agenda, the R&D Investment Criteria were first applied in 2001 to selected R&D programs at DOE. Through the lessons learned from that DOE pilot program, the criteria were subsequently broadened in scope to cover other types of R&D programs at DOE and other agencies. To accommodate the wide range of R&D activities, a new framework was developed for the criteria to address three fundamental aspects of R&D:

- *Relevance* – Programs must be able to articulate why they are important, relevant, and appropriate for Federal investment;
- *Quality* – Programs must justify how funds will be allocated to ensure quality; and
- *Performance* – Programs must be able to monitor and document how well the investments are performing.

In addition, R&D projects and programs relevant to industry are expected to meet criteria to determine the appropriateness of the public investment, enable comparisons of proposed and demonstrated benefits, and provide meaningful decision points for completing or transitioning the activity to the private sector.

OSTP and OMB are continuing to assess the strengths and weaknesses of R&D programs across the Federal government in order to identify and apply good R&D management practices throughout the government.

CONCLUSION

Mr. Chairman and members of the committee, I believe this is a good budget for science and technology. This Administration is committed to strong science and technology as a foundation for national security and economic strength. I would be pleased to respond to questions.