

Statement of Dr. John Marburger, III
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to the
Committee on Science and Technology
United States House of Representatives
Fiscal Year 2008 Federal R&D Budget
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Chairman Gordon, Ranking Republican Member Hall, and Members of the Committee, I am pleased to appear before you today to present the President's Fiscal Year 2008 research and development (R&D) budget. Although this is my sixth year coming before the Committee to discuss the President's R&D program, it is my first under the new Congressional leadership. I am aware that this Committee has expressed bipartisan support for science funding in the past, and values scientific research and its applications for the benefits it brings to every part of our society. On behalf of the Administration, I thank the Committee for the good working relationship it has established with the science agencies and with my office, and look forward to working together in the future to advance American innovation and competitiveness.

This year, President Bush presents a Federal Budget that will balance in five years. The President proposes to do this by continuing strong pro-growth economic policies and by holding non-security discretionary spending below inflation. This strategy inevitably requires establishing priorities and allocating resources to achieve the greatest impact. Winning the war on terror, securing the homeland and strengthening the economy remain the President's top priorities, and this year's budget once again emphasizes investments in America's future competitiveness through research and development. The President is proposing a record \$142.7 billion 2008 Federal R&D Budget, an increase of \$5.5 billion over the 2007 Budget. And while the overall 2008 non-defense discretionary budget grows by on 0.65 percent relative to the 2007 levels in the current continuing resolution, non-defense R&D is increased by 4.26 percent, or almost seven times faster. The President's commitment to the government's R&D enterprise is strong, and the advancement of science remains among his top budget priorities.

While significant increases have occurred for defense-related development – most of the "D" in R&D- it is important to be aware of the very significant growth during this Administration in non-defense research spending, as shown in an accompanying chart. Non-defense R&D has continued on a significantly upward trajectory. In fact, with President Bush's 2008 Budget, real growth in outlays for the conduct of non-defense R&D -- i.e. corrected for inflation -- is up 26.5 percent in seven years during this Administration.

With the launch of the American Competitiveness Initiative (ACI) last year and further discussion of the importance of research and development to our future energy independence this year, President Bush's recent State of the Union addresses advance a strong agenda for science and technology. This focus on research and development, science and math education, and other technology themes directly supports our National goals of securing the nation, protecting the homeland, and making the economy strong.

Before I get into the specifics of this year's research budget, I want to express my concern about the very serious deleterious impacts of earmarking on the science budget. I do this knowing that this Committee already fully appreciates the problem and supports best practices in the allocation of research funding. As we discuss the importance of pursuing the best science to contribute to U.S. competitiveness, I hope the Congress will eliminate research earmarks in the FY 2008 appropriations process, as it is so commendably doing in a spirit of reform for the current fiscal year.

The 2008 Budget raises funding for the category of Basic Research almost \$1 billion above the last appropriated level of 2006: \$28.4 billion compared with \$27.5 billion. Since the effect of last year's earmarks only enhance this difference and make the real programmatic increases even bigger, in my view this is a direct indication of the Administration's strong focus on fundamental research and the discovery of new knowledge as a leading mission of the Federal government. It is notable that this favorable treatment of Basic Research is occurring in a year of belt-tightening for many other domestic programs, indicating the high priority this Administration places on the importance of this activity.

Basic Research is not the complete measure of investment activities that drive future innovation. The accounting category known as the Federal Science and Technology Budget emphasizes both basic and applied science and engineering research short of development, and thus captures other important activities relevant to competitiveness. This category advances \$1.3 billion in 2008 relative to FY 2006 levels, and when only civilian S&T agencies are considered, that represents a four percent increase. If Congress funds the President's 2008 request and avoids earmarking, FS&T funds available for science agency programs will increase \$1.5 billion from the President's own 2007 Budget.

As the next now-familiar chart displays, the American Competitiveness Initiative identifies three priority science agencies: the National Science Foundation; DoE's Office of Science; and the laboratories of the National Institute of Standards and Technology. The 2008 Budget calls for a 7.2% increase on top of 2007's 9.3% requested increase. This additional \$764 million brings the total two-year ACI Research incremental investment to \$2.6 billion.

As I prepared this testimony, the then-current draft of the FY 2007 Continuing Budget Resolution (CR) provides only 50 percent of the first-year ACI budget. As you can see on this table, that is \$452 million short of the President's request. I know this Committee is as disappointed as I am at this shortfall for science. The Statement of Administration Policy on the continuing resolution makes clear this is not sufficient to meet America's competitiveness challenge, and falls short of the doubling path that is an important component of the Initiative. If not corrected before completion of the FY 2007 process, a year of enhanced and expanded high-impact innovation research will be lost and a \$1.2 billion increase would be required in 2008 to "catch-up" to the President's commitment. This would require a difficult 12% increase in 2008.

While future competitiveness is the featured priority goal in this science budget, other science areas remain important to our nation's goals. Since 2002, the Administration has spent approximately \$9 billion on climate change science research through the multi-agency Climate

Change Science Program, and the President's 2008 Budget sustains the level of effort. Further, between 2003 and 2006, the President has committed nearly \$3 billion annually to the climate change technology research and deployment programs that constitute the multi-agency Climate Technology Program. The U.S. leads the world in advancing climate science and technology, with expenditures of nearly \$29 billion in climate-related science, technology, international assistance, and incentive programs during this Administration.

Undoubtedly previous investments in energy-related science and technology have put the U.S. well on track to meet the President's goal of reducing greenhouse gas intensity 18 percent by 2012. In other programs relevant to the environment, the 2008 Budget includes funding for a number of related Earth Observations programs including ocean observing systems, earthquake monitoring and prediction, tsunami warnings, Landsat, and the Global Precipitation Measurement mission. This year's budget also includes a new Ocean Initiative with over \$80 million in new 2008 funding for ocean science and research at the National Oceanic and Atmospheric Administration, NSF and the U.S. Geological Survey.

Biomedical research is supported in the 2008 NIH Budget with an increase of \$431 million over the 2007 request. This will allow NIH to award over 10,000 new and competing research grants, an increase of more than 900, and will double the New Investigators program. The NIH Director's Roadmap Initiative is increased 10 percent in 2008 to enhance this interdisciplinary incubator for new ideas that will accelerate the pace of discovery across the NIH's 27 Institutes and Centers.

The Advanced Energy Initiative (AEI) at DoE is funded at \$2.7 billion in the 2008 Budget, which is a 26 percent increase over the President's 2007 request and almost \$1 billion more than 2006. The AEI will contribute to the President's goal of cutting gasoline use by 20 percent in 10 years by accelerating the technical and cost viability of plug-in hybrids, hydrogen-powered fuel cells, and "cellulosic" ethanol derived from biomass. AEI will also accelerate clean electricity generation technologies such as solar, wind, nuclear, and clean coal. Perhaps most critically, the 2008 AEI includes over \$700 million in basic research at DoE's Office of Science, a 32 percent increase, to overcome major technical barriers to the use of solar, biomass, hydrogen and fusion. With the 2008 Budget, the Presidential commitment to invest \$2 billion on clean coal research is fulfilled, as is President Bush's commitment to propose a five-year, \$1.2 billion Hydrogen Fuel Initiative.

This Administration's National Nanotechnology Initiative also strongly continues with \$1.45 billion in 2008 for this multi-agency, well-coordinated investment in fundamental research, multi-disciplinary centers of excellence, and development of focused cutting-edge research and education infrastructure. With the 2008 request, over \$8 billion will have been spent on nanoscale R&D in seven years. The NNI also supports activities addressing the societal implications of nanotechnology, including those related to human and environmental health and methods for managing potential risks.

Finally, let me finish by expressing a concern regarding NASA and the budget danger that lies ahead for this agency. The President's FY 2008 Budget includes a 3.1 percent increase for NASA in 2008 on top of the President's 3.4 percent requested increase for 2007. However, the

2007 full-year CR as it stands now cuts NASA \$545 million from the President's request. That leaves NASA at its 2006 level with no increase and puts at risk the Vision for Space Exploration and priority Earth and space science missions. Certainly at risk is the timely development of a new, much more capable U.S. human spacecraft to follow the Shuttle which will be retired in 2010.

AGENCY BUDGET HIGHLIGHTS

National Science Foundation (NSF):

Funds are requested to increase the budget for NSF to \$6.43 billion in FY 2008, 45 percent above 2001's \$4.43 billion level. Similar investments in the past have yielded important scientific discoveries, which boost economic growth and enhance Americans' quality of life.

The centerpiece of the American Competitiveness Initiative is President Bush's plan to double investment over a 10-year period in key Federal agencies that support basic research programs emphasizing the physical sciences and engineering. NSF is one of the three key agencies, as it is the primary source of support for university and academic research in the physical sciences, funding potentially transformative basic research in areas such as nanotechnology, advanced networking and information technology, physics, chemistry, material sciences, mathematics and engineering.

NSF has central roles in two previously mentioned Administration priority research areas that promise to strengthen the Nation's economy: the National Nanotechnology Initiative (NNI) and the Networking and Information Technology R&D program (NITRD). NSF-funded nanotechnology research, proposed at \$390 million in FY 2008, a 5 percent increase over the 2007 request and 160 percent since 2001, has advanced our understanding of materials at the molecular level and has provided insights into how innovative mechanisms and tools can be built atom by atom. This emerging field holds promise for a broad range of developing technologies, including higher-performance materials, more efficient manufacturing processes, higher-capacity computer storage, and microscopic biomedical instruments and mechanisms. NSF's investments in NITRD, funded at \$994 million in 2008, up \$90 million over 2007 and 56 percent since 2001, support all major areas of basic information technology (IT) research. NSF also incorporates IT advances into its scientific and engineering applications, supports using computing and networking infrastructure for research, and contributes to IT-related education for scientists, engineers, and the IT workforce.

The 2008 NSF Education and Human Resources (EHR) budget will continue efforts to prepare U.S. students for the science and engineering workforce with a 7.5 percent increase (+\$53 million) over the level in the House-passed 2007 full-year CR, adjusted for the movement of EPSCoR to the Research and Related Activities account. To further strengthen NSF's emphasis on increasing the quality and quantity of the science and engineering workforce and ensuring that undergraduate students are well prepared for an increasingly technological global society, EHR will increase funding for its undergraduate education portfolio by \$13.4 million. This total

includes \$3.5 million for the Course, Curriculum, and Laboratory Improvement program and \$5.1 million for the Advanced Technological Education program to improve technician training at community colleges. The FY2008 EHR budget also provides an increase of \$8.9 million for the Graduate Research Fellowship program, an amount that will support an additional 200 graduate students, and \$4.53 million for the Centers of Research Excellence in Science and Technology, a program designed to broaden participation in the science and engineering workforce. NSF's K-12 education programs remain strong with \$30 million made available in FY2008 for new awards under the Math and Science Partnerships program.

Department of Energy (DOE):

DOE implements the President's Advanced Energy Initiative (AEI), highlighted above. The 2008 AEI Budget proposes:

- \$217 million for the solar R&D to accelerate development of cost-effective photovoltaic materials;
- \$292 million for the biomass R&D, including \$179 million for the Biofuels Initiative and an additional \$113 million in supporting basic research, to help enable cellulosic ethanol to become practical and competitive;
- \$42 million for development of high-energy, high-power batteries for hybrid-electric and "plug-in" hybrid vehicles;
- \$309 million for the Hydrogen Fuel Initiative to accelerate development of hydrogen production, storage, and infrastructure technologies that can help make possible the use of hydrogen-powered fuel cell vehicles and infrastructure to support them;
- \$40 million for wind energy research to help improve the efficiency and lower the costs of wind technologies for use in low-speed wind environments, and to help overcome technical and regulatory barriers to more wide-scale deployment of wind technologies; and
- \$108 million for the FutureGen Initiative to develop technologies for a coal gasification plant with near-zero atmospheric emissions.

The 2008 AEI budget also proposes \$395 million for the Global Nuclear Energy Partnership in Nuclear Energy with the goals to demonstrate advanced fuel cycle technologies, to expand the domestic use of nuclear power, and to provide for safe, environmentally responsible global nuclear energy systems that support non-proliferation objectives. Full funding of \$160 million for the U.S. contribution to the ITER international fusion energy project is included as well.

The Office of Science in DoE (DoE-SC) is one of the three priority research agencies in the President's American Competitiveness Initiative, supporting scientific studies and infrastructure for a wide range of basic research related to potentially significant innovations. The 2008 Budget provides \$4.4 billion for DoE SC, an increase of 16 percent over the level in the 2007 House-passed full-year continuing resolution (CR), which is \$306 million below the President's 2007 ACI request. The Budget includes funding for priorities such as nanotechnology (\$286 million), materials science research facilities (\$699 million), basic research in support of the hydrogen fuel initiative (\$60 million), the advanced energy initiative (\$713 million), and high-end computing facilities and research (\$340 million). The Budget also completes funding (\$45

million) for project and engineering design of the National Synchrotron Light Source II, a new x-ray light source that will enable the study of materials properties and functions at a level of detail and precision (nanoscale) never before possible. It continues support for construction of the Linac Coherent Light Source—a materials research facility that will provide laser-like x-rays allowing an unprecedented real-time glimpse of chemical and biological processes, fully funds operations for the five nanoscale science research centers, and provides funding for the project and engineering design for the upgrade of the Continuous Electron Beam Accelerator Facility.

National Institute of Standards and Technology (NIST):

The Department of Commerce's NIST "core" research and facilities receive \$594 million in 2008, an increase of 21 percent from the level in the 2007 House-passed full-year CR, which is \$44 million below the President's 2007 ACI request. In 2008, the American Competitiveness Initiative proposes NIST funding increases of \$69 million for new initiatives in research and measurements in high-leverage areas such as the Disaster-Resilient Structures and Communities Program, the interagency Climate Change Science Program, and the interagency National Earthquake Hazards Reduction Program. Support continues for high-leverage, broad impact research in quantum information processing, nanotechnology, and new and expanded capabilities at the NIST Center for Neutron Research and at its Boulder, Colorado, high-performance labs.

National Aeronautics and Space Administration (NASA):

The President's 2008 Budget for NASA is \$17.3 billion, a 3.1 percent increase over the President's 2007 request, reflecting a strong commitment by the Administration to the continued pursuit of the Vision for Space Exploration. The 2007 House-passed full-year CR, however, reduces the 2007 Budget by \$545 million to \$16.2 billion. If NASA is not provided its 2007 request level of \$16.8 billion, the agency needs flexibility within its appropriation accounts to reduce the adverse consequences of a top-line reduction.

In 2008, NASA requests \$3.92 billion for exploration systems including the Orion Crew Exploration Vehicle (CEV) and the Ares I launch vehicle that will carry astronauts to the Moon. Having already initiated the acquisition process for certain elements of this architecture during 2006, NASA anticipates that all Orion CEV and Ares I elements will be under contract by the end of 2007, with the first crewed-flight planned to occur no later than 2014.

The 2008 Budget requests \$5.52 billion, almost a third of NASA's total budget, to continue operating the 59 spacecraft of NASA's Science Mission Directorate and to support investments in future Earth and space science missions, vital technologies, and frontier research. NASA will develop seven new Earth observing space missions, including the Landsat Data Continuity Mission and the Global Precipitation Measurement mission, which will launch no later than 2013. NASA will continue its roles in the interagency Climate Change Science Program and the international initiative on the Global Earth Observing System of Systems. NASA will also support studies of the Earth-Sun system using data from the STEREO mission and the upcoming Solar Dynamics Observatory. A new Lunar Science Research program will leverage robotic

investigations of the lunar surface in support of the Vision for Space Exploration. Following up its missions to Mars and Saturn, NASA is sending ever-more capable spacecraft to Mars, Mercury, the asteroids, and Pluto. NASA also will continue its vibrant astronomy program through its Great Observatories, and will upgrade Hubble in 2008 to provide five more years of productive on-orbit life, while planning new spacecraft, such as Webb and Kepler, that will search for planets around other stars and peer deep into the universe. Funding for the Beyond Einstein program is increased in FY 2008 to act on the forthcoming recommendation from the National Research Council regarding a strategy to unlock the secrets of the fundamental physics of the universe.

In December 2006, the President approved the nation's first National Aeronautics R&D Policy. Consistent with this Policy, the 2008 NASA aeronautics budget prioritizes fundamental aeronautics research, the improvement of aviation safety, and research that will help support the development of the Next Generation Air Transportation System. In addition, NASA will address infrastructure upgrades and maintenance requirements for aeronautical test facilities across NASA centers that are of vital importance to the Nation. The 2008 Budget requests \$554 million for NASA aeronautics, an almost 5 percent increase over the 2007 request after adjusting for NASA's implementation of simplified full-cost accounting.

National Oceanic and Atmospheric Administration (NOAA):

For NOAA in the Department of Commerce, the FY 2008 Budget provides \$358 million for Oceanic and Atmospheric Research (OAR), a \$20 million increase over the 2007 Budget. OAR provides for ongoing research on climate, weather, air quality, and ocean processes.

The 2008 NOAA budget supports a new interagency oceans initiative to implement the President's U.S. Ocean Action Plan including \$60 million in new funding over the 2007 Budget to advance oceans science and research (of which \$13 million is in OAR). \$20 million will address four near-term ocean research priorities established by the Ocean Research Priorities Plan and Implementation Strategy (ORPPIS), published in January (with another \$20 million from NSF and USGS). The NOAA Budget also proposes \$8 million to develop an operational ocean monitoring network, for technology and other infrastructure to support ocean science, for International Polar Year activities, and for research on protected species and commercial fisheries.

United States Geological Survey (USGS):

The President has proposed a budget of \$975.0 million for USGS in the Department of the Interior in Fiscal Year 2008. The proposed budget includes an increase of \$3 million for the new oceans initiative activities, including \$1.5 million in the Coastal and Marine Geology program to begin implementation of the Oceans Research Priorities Plan and Implementation Strategy. This involves conducting observations, research, and sea-floor mapping and developing forecast models. The budget also includes \$1.5 million in the Hydrologic Networks and Analysis

program to begin implementation of an interagency National Water Quality Monitoring Network that will integrate watershed, coastal waters, and ocean monitoring based on common criteria.

The FY 2008 USGS budget continues funding for operations and maintenance of Landsats 5 and 7. The Budget also funds efforts with NASA and the Landsat Science Team to continue development of the Landsat Data Continuity Mission. The FY 2008 budget includes \$24 million for Landsat 8.

Environmental Protection Agency (EPA):

The FY 2008 Budget for science and technology funding at EPA is \$755 million. Research priorities include supporting the agency's risk assessment programs including Air Quality Science Assessments (formerly called the Air Quality Criteria Documents) and the Integrated Risk Information System (IRIS), and the Science to Achieve Results (STAR) program of extramural research and graduate fellowships in areas of environmental science and engineering. \$69 million is requested to fund new and ongoing research in water security, including monitoring and surveillance of terrorist threat agents, and post-incident decontamination.

Department of Transportation (DOT):

The FY 2008 Budget request for highway-related research is \$430 million, consistent with the level in the multi-year surface transportation research authorization. Highway research includes the Federal Highway Administration's transportation research and technology contract programs. These research programs include the investigation of ways to improve safety, reduce congestion, improve mobility, reduce lifecycle construction and maintenance costs, improve the durability and longevity of highway pavements and structures, enhance the cost-effectiveness of highway infrastructure investments, and minimize negative impacts on the natural and human environment.

The 2008 Budget request for Federal Aviation Administration (FAA) Research, Engineering, and Development is \$140 million, including \$63 million focused on the advancement of the Next Generation Air Transportation System led by its Joint Planning and Development Office.

In addition, the 2008 Budget requests \$12 million for the Research and Innovative Technology Administration to coordinate and advance the pursuit of transportation research that cuts across all modes of transportation, such as hydrogen fuels, global positioning and remote sensing. DOT research programs also support the National Nanotechnology Initiative, the U.S. Climate Change Technology Program, and the President's Hydrogen Fuel Initiative.

Department of Defense (DoD):

DoD's FY 2008 R&D budget is almost \$79 billion. This level of funding will support the Department's commitment to transform its capabilities and forces for greater agility, while enabling effective responses to asymmetric and uncertain challenges of future conflicts.

These funds will also help address emergent threats through countermeasures to biological agents and will advance novel technologies to detect and neutralize improvised explosive devices, mines, rockets and mortars. DoD provides the largest share of NITRD program funding, over \$1 billion, to address IT needs for the Nation's defense. Likewise, DoD invests \$375 million under the National Nanotechnology Initiative, emphasizing development of materials, devices and systems that address the national security mission.

The Science and Technology (S&T) component of the overall DoD R&D budget includes basic research (6.1), applied research (6.2), and advanced technology development (6.3). At \$10.8 billion in the FY 2008 Budget, DoD S&T exceeds the 2001 enacted level by 21 percent, or \$1.8 billion. From 2000 to 2007, Congressional adds to DoD S&T quadrupled. For 2007, there were over 1200 of these adds (totaling \$2.8 billion), most of which must be identified and tracked down, advertised in a way specific to the Congressional mark, evaluated, negotiated and awarded, in some way separate from other potential awards. This means that those awards consume several times the staff and management resources of the average research award, and may not even target a military-specific research need. The large number of such additions creates impediments to the creation of effective research programs throughout the Department, and should be cause for concern to Congress as well as to the Administration.

A total of \$1.43 billion is provided for DoD 6.1 basic research in 2008. This is a nominal increase over the 2007 Budget and represents 13.3 percent of the DoD S&T Budget, more than last year's 12.8 percent share.

Department of Homeland Security (DHS):

The President's FY 2008 request includes \$799 million for the DHS Directorate of Science and Technology and \$562 million for the Domestic Nuclear Detection Office. R&D continues to play a key role in securing the Nation against the terrorist threat. The President's 2008 Budget maintains an aggressive investment in scientific research, technology development, and research infrastructure aimed at continuing to enhance our Nation's security. Priority research areas include: \$100 million in transformational R&D aimed at enhancing our ability to detect, identify, and attribute nuclear and radiological materials; \$68 million for explosives countermeasures research; and \$15 million to fund cyber security and information assurance R&D.

CONCLUSION

Making choices is difficult even when budgets are generous, but tight budgets require priorities to be focused, and program management to be strengthened. This year's R&D budget proposal provides robust levels of investment that allow America to maintain its leadership position in science and move ahead in selected priority areas. The American Competitiveness Initiative and Advanced Energy Initiative properly focus R&D investments in areas that will increase our economic competitiveness, decrease our dependence on foreign oil, and accelerate development of clean energy technologies.

America currently spends one and a half times as much on Federally-funded research and development as Europe, and three times as much as Japan, the next largest investor. Our scientists collectively have the best laboratories in the world, the most extensive infrastructure supporting research, the greatest opportunities to pursue novel lines of investigation, and the most freedom to turn their discoveries into profitable ventures if they are inclined to do so.

We lead not only in science, but also in translating science to economically significant products that enhance the quality of life for all people.

This budget will sustain this leadership and maintain science and technology capabilities that are the envy of the world. I ask that Congress fully fund the initiatives advanced in the President's proposal. I would be pleased to respond to questions.