

Electrotechnology-Related Research in the FY 2008 Budget

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HIGHLIGHTS

- One of the beneficiaries of the President's goal of doubling research at key agencies over a 10-year period, the National Science Foundation (NSF) would see significant gains in FY 2008. The NSF R&D budget would increase 8.3 percent to a level of \$4.9 billion (see Table II-7).
- Despite a record budget for the Department of Defense (DOD), funding for Science and Technology (S&T) would see another large decrease in FY 2008. S&T funding would decrease by \$2.8 billion to a level of \$10.9 billion, a reduction of 20.1 percent (see Table II-2).
- The National Aeronautics and Space Administration (NASA) is still investing heavily in the next-generation Crew Launch Vehicle and Crew Exploration Vehicle, inflating NASA's R&D budget, but aeronautics research would continue its freefall with a cut of 20 percent to \$554 million, a reduction of \$141 million (see Table II-12).
- After steep cuts in FY 2007, funding for R&D at the Department of Homeland Security (DHS) would continue to see budget cuts (down \$8 million to \$996 million) as DHS undergoes a major reorganization. The largest component of the DHS R&D budget, the Domestic Nuclear Detection Office, is now a stand-alone office devoted to radiological and nuclear countermeasures (see Table II-6).
- The Department of Energy (DOE) is an agency targeted for doubling over a 10-year period through the American Competitiveness Initiative (ACI). Accordingly, the budget for DOE R&D will see a 5.7 percent increase to \$9.2 billion (see Table II-11).

- Although the NIST R&D budget would increase by 4.7 percent to \$514 million as a result of the ACI, the gains would be offset by the elimination of the Advanced Technology Program and a 50 percent reduction in the Manufacturing Extension Partnership (see Table II-14).
- The National Nanotechnology Initiative (NNI) budget is set for a 3.8 percent, \$53 million increase in FY 2008 to \$1.4 billion, capping a tripling of the NNI budget since FY 2001 (see Table I-9).

INTRODUCTION

The following chapter is a broad summary of the Bush Administration's proposed FY 2008 funding levels for select electrotechnology R&D programs at the NSF, NASA, DOE, DOD, DHS, the Department of Commerce and two multi-agency initiatives—the NNI and the Networking and Information Technology Research and Development Program (NITRD). The budget figures contained in this analysis are expressed in current dollars and are based on data provided by the federal agencies at the release of the Administration's FY 2008 budget.

The Bush Administration's President's Budget Request (PBR) for FY 2008 reflects the President's desire to increase funding at several key agencies through his proposed American Competitiveness Initiative (ACI). Although the budgets for these agencies would benefit from the ACI, the gains would be offset by cuts or flat funding in many other parts of the R&D budget.

NATIONAL SCIENCE FOUNDATION (NSF)

The Administration has targeted NSF, along with the DOE's Office of Science and the NIST laboratories, for doubling of those budgets over a 10-year period through the American Competitiveness Initiative (ACI). ACI is in its second year and accordingly, the total NSF budget would increase by \$513 million (8.7 percent) to \$6.4 billion (see Table II-7). In his remarks accompanying the presentation of the budget NSF Director Arden L. Bement, Jr., said that with these funding increases, ACI aims to "expand federal research over the next ten years to drive innovation and sharpen America's competitive edge." "NSF works at the frontier of knowledge," said Bement, "where high-risk, high-reward research can lay the foundation for revolutionary technologies and tackle complex problems that challenge society."

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Director Bement singled out several electrotechnology-related priorities for NSF, including a new project to develop enhanced computational tools and methods called Cyber-Enabled Discovery and Innovation, high-end computing research in the NITRD initiative, and increased investments in NSF participation in the NNI. NSF will also seek to improve America's science and technology education through increased funding for the Math and Science Partnership and its Graduate Research Fellowships Program.

NSF supports seven major research areas, or Directorates. In the President's budget request, all of these separate research areas would increase, anywhere from 3.9 to 28.2 percent.

NSF's overall R&D investment, excluding non-R&D activities, would increase by 8.3 percent to \$4.9 billion (see Table II-7). NSF's main Research and Related Activities account, which funds nearly all of NSF's basic and applied research, increases by 7.7 percent to \$5.1 billion (this includes non-R&D activities). Most research directorates receive increases ranging from four to nine percent. The only sub-directorate to receive a significant cut is Information Technology research under Computer and Information Science and Engineering (CISE), which would be cut \$43 million (a 35.7 percent reduction) to \$78 million. A new Office of Cyberinfrastructure, a recent spin-off from CISE, would see its funding increase by \$18 million (9.6 percent) to \$200 million.

The NSF's contribution to NNI would increase by \$17 million to \$390 million. According to Director Bement, the funding increase is for fundamental nanoscale research, development of nanomaterials, and programs directed towards environmental, health, and safety impacts of nanotechnology. Also, \$25.8 million would be made available for multidisciplinary research on interactions between particles, nanoscale materials and the living world.

Major Research Equipment and Facilities Construction would receive a significant funding increase with a 28.2 percent or \$54 million increase to \$245 million. (For more on NSF, see Chapter 6.)

DEPARTMENT OF DEFENSE (DOD)

DOD funding continues to be dominated by the war in Iraq and the global war on terror. According to the President's budget, priorities are

ensuring a high state of military readiness and ground force strength and continuing the development of capabilities to maintain U.S. superiority. While the DOD budget and the DOD R&D budget will both reach record highs, the state of Science and Technology (S&T) research at DOD continues to slide downward dramatically.

DOD accounts for more than one-third of all engineering research performed in U.S. academic institutions through the military's Research, Development, Test and Evaluation (RDT&E) program. RDT&E provides funding for future military hardware and software and their underlying technologies, covering the full spectrum of R&D. From the most basic research to advanced, full-scale, military systems development, RDT&E collectively consists of seven budget activities:

The DOD RDT&E program includes Basic Research ("6.1"), Applied Research ("6.2"), Advanced Technology Development ("6.3"), Advanced Component Development ("6.4"), Systems Development and Demonstration ("6.5"), Management Support ("6.6"), and Operational Systems Development ("6.7"). RDT&E is the federal government's single largest R&D account. DOD "6.1", "6.2", "6.3", and medical research collectively are designated as "science and technology (S&T)."

The overall DOD R&D budget would reach \$79 billion, a 1.0 percent increase over FY 2007 (see Table II-2). However, basic and applied research and advanced technology development at each of the branches of the military would fall across the board, and DOD S&T would be cut substantially with a \$2.8 billion cut to \$10.9 billion, down 20.1 percent.

The Army, Navy and Air Force S&T accounts would be reduced by \$1.1 billion (39.1 percent); \$366 million (17.9 percent) and \$635 million (24.4 percent), respectively (see Table II-5).

The Advanced Component Development accounts ("6.4") would stay nearly flat at \$15.8 billion. Systems Development ("6.5") would be cut by 3.9 percent, or \$0.8 billion, to a level of \$18.6 billion. Management Support ("6.6") would fall by \$45 million to a level of \$4.2 billion. Only Operational Systems Development ("6.7") would escape the knife, with a 16.3 percent increase of more than \$4.0 billion, to \$28.6 billion.

Other defense agencies, which include the Defense Advanced Research Projects Agency (DARPA), would see their S&T budgets reduced by

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\$431 million (7.4 percent). DARPA's mission is to "develop imaginative, innovative and often high-risk research ideas, offering a significant technological impact that will go beyond the normal evolutionary developmental approaches." DARPA funding in the FY 2008 budget would see a rare decrease of 1.0 percent to a level of \$3.1 billion. (See Table II-3. For more on DOD, see Chapter 5.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

The budget for NASA seeks to achieve a balance between the Bush Administration's vision for manned space exploration and the country's civil space and aeronautics research goals, according to NASA Administrator Michael Griffin. "The FY 2008 budget request has been carefully considered," said Griffin, "and it balances many competing demands upon limited resources." Although the NASA budget received a slight cut for FY 2007 as a result of the joint funding resolution, funding for FY 2008 would bounce back with a 6.5 percent increase to a historic high of \$17.3 billion. NASA's R&D budget would likewise increase by 6.7 percent to a level of \$12.6 billion (see Table II-12).

The NASA budget contains three accounts: Exploration Capabilities (EC), Science, Aeronautics and Exploration (SAE), and the non-research Inspector General. The EC budget contains the International Space Station (ISS) and the Space Shuttle, and would see a 12.9 percent increase to \$6.8 billion. Within EC, funding for the Space Shuttle would be essentially flat with a 1.3 percent increase at \$4.0 billion, while the ISS and Space Flight Support would both see significant increases of 29.0 percent and 69.2 percent, respectively.

The SAE account would increase by 2.8 percent to a level of \$10.5 billion. Most of the R&D funding increase would be designated for development of the Orion Crew Exploration Vehicle and the Ares Crew Launch Vehicle through the Constellations Systems Theme in the Exploration Systems Mission Directorate (ESMD). Funding for Constellation Systems would increase 10 percent over FY 2007, to a level of \$3.1 billion. According to Administrator Griffin, this increase is designed to help realize Congress' and the Administration's commitment to a "journey of exploration: returning to the Moon in the next decade, then on to Mars and beyond." ESMD also includes the Advanced Capabilities Theme, which provides funding for projects designed to "reduce operational and technical risks for Constellation Systems

projects,” such as astronaut risk mitigation, laboratories and lunar robotic missions.

The biggest loser in the NASA budget continues to be Aeronautics research under the SAE directorate. For several years, this budget has taken significant hits as the Administration sets its priorities in space exploration. For FY 2008, aeronautics research would fall 20 percent to a level of \$554 million, a cut of \$141 million. NASA does plan a service mission to repair and upgrade the Hubble Space Telescope, and also plans to build the Kepler and James Webb Space Telescopes for deep space exploration. (For more on NASA, see Chapter 9.)

DEPARTMENT OF HOMELAND SECURITY (DHS)

DHS R&D funding would fall again, albeit slightly, in FY 2008 after steep cuts in FY 2007. Total DHS R&D would decrease by \$8 million to \$996 million (see Table II-6). The DHS S&T Directorate is currently undergoing a major reorganization under new Undersecretary of Science and Technology Jay Cohen, in response to congressional criticism of how DHS R&D has been conducted and how research funding was handled. DHS funding for R&D, as presented, may be only a placeholder until Cohen’s reorganization is complete. The final 2008 budget may be significantly altered before it is finalized.

The Directorate for Science and Technology (S&T Directorate) is DHS’ primary R&D arm. The stated mission of the S&T Directorate is to “protect the homeland by providing federal and local officials with state-of-the-art technology and other resources.” It does so by “enabling research into technology to provide the capabilities to “anticipate, prevent, respond to and recover from terrorist acts.” R&D in the S&T Directorate would fall 7.9 percent or \$57 million to \$656 million. Most of the programs funded by the S&T Directorate would see declining budgets. The largest reduction is for Chemical and Biological S&T, which would decline by \$85 million or 27 percent to \$229 million.

The largest component of the DHS R&D budget is the Domestic Nuclear Detection Office (DNDO), which was created out of the S&T Directorate in 2006. It is now a stand alone office devoted to radiological and nuclear countermeasures. After being created with an initial budget of \$273 million for R&D in FY 2007, the DNDO would receive another large increase of \$47 million or 17.4 percent to \$320 million in FY 2008.

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Of this increase, \$30 million has been requested for implementing the DNDO's *Securing the Cities* initiative, which includes assessment of the critical infrastructure vulnerabilities. R&D directed towards detection of weapons of mass destruction dominates the DHS R&D budget when DNDO R&D on radiological and nuclear countermeasures is combined with research against biological, chemical and explosives threats.

The extramural aspect of the DHS S&T budget is coordinated through the Homeland Security Advanced Research Project Agency (HSARPA), which is modeled after DOD's DARPA. HSARPA provides grants for basic and applied research to assist the agency to "conduct rapid prototyping and commercial adaptation," and to "research revolutionary options." Funding for University and Fellowship Programs would suffer additional losses, declining from \$49 million in 2007 to \$39 million in 2008, a drop of \$10 million or 20.3 percent. Funding for University and Fellowship Programs has declined by a third in the past two years. This program funds university-based centers that consist of multi-year university consortia directed to R&D for homeland security.

The DHS has also requested \$21.9 million in new money to form a Science and Technology Office of Innovation, which will be charged with developing "game-changing and leap-ahead technologies" to address critical agency exigencies, including developing a resilient electric grid, tunnel detection at the borders, detecting and dispatching improvised explosive devices, and development of Man-Portable Air Defense Systems technology. (For more on DHS, see Chapter 11.)

DEPARTMENT OF ENERGY (DOE)

In the FY 2008 budget, DOE crafted a budget with the goal of "stay[ing] on course to address the growing demand for affordable, clean and reliable energy; preserve our national security; and enable scientific breakthroughs that will have significant impacts on our quality of life and the health of the American people." DOE, which is a strong supporter of electrotechnology-related basic research in the U.S., is charged with "[protecting] our national and economic security by providing a world-class scientific research capacity and advancing scientific knowledge."

The DOE budget continues to benefit significantly as a part of both the President's Advanced Energy Initiative (AEI) and the American

Competitiveness Initiative (ACI). Most of the federal budget is flat for FY 2007 due to a year-long joint funding resolution; however, DOE's Office of Science budget actually increased by \$200 million with a late amendment to the FY 2007 funding resolution. The President's budget request for FY 2008 continues this sharp upward trend with a 5.7 percent increase to \$9.2 billion for DOE R&D (see Table II-11).

DOE is also a key agency in the AEI, which seeks to accelerate the deployment of renewable energy, clean coal and nuclear energy technologies to "reduce U.S. dependence on foreign sources of energy and transform the energy economy by promoting the development of cleaner sources of electricity production." The FY 2008 budget request contains a 26 percent increase over FY 2007 for the AEI.

The budget request for the Office of Science is \$4.4 billion, an increase of 15.8 percent over FY 2007. Within the Office of Science, one of the biggest winners would be Fusion Energy Science (FES), which funds the U.S. commitment to the International Thermonuclear Experimental Reactor (ITER), a proposed joint international fusion reactor project. Basic research in FES would increase 34 percent, or \$109 million, to \$428 million, with \$160 million going towards ITER. The largest account in OS, Basic Energy Sciences, would receive a 19.9 percent or \$248 million increase to \$1.5 billion. Advanced Scientific and Computing Research would increase by 20 percent to \$340 million. High Energy Physics would receive a 4.1 percent increase of \$30 million to \$782 million. The request also includes \$75 million for three innovative Bioenergy Research Centers to accelerate basic research in the development of biofuels and other synthetic fuel technologies.

Another energy priority for the Bush administration is to "expand the resurgence of nuclear power." To accomplish this goal, the President's budget request contains an increase of \$155 million for the Global Nuclear Energy Partnership (GNEP) to a level of \$405 million. The goal of GNEP is to "bring about significant, widescale use of nuclear energy through the development of better, more efficient and proliferation-resistant nuclear fuel cycles, while reducing the volume of nuclear waste requiring ultimate disposal." (For more on the DOE, see Chapter 8.)

NATIONAL NANOTECHNOLOGY INITIATIVE (NNI)

The National Nanotechnology Initiative (NNI) is a multi-agency

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initiative established to coordinate nanoscale science, engineering and technology research. NNI also supports the creation and maintenance of state-of-the-art nanotechnology research laboratories.

After only a slight increase in FY 2007, the NNI is set for a 3.8 percent, \$53 million increase in the President's FY 2008 budget to \$1.4 billion (see Table I-9). This increase caps off a tripling of the NNI budget since its inception in FY 2001 when funding was \$464 million. According to NNI, this tripling "reflects the consistent, strong support of the Administration and Congress for this program, based on its potential to expand our fundamental knowledge, and to make important contributions to national priorities, such as economic competitiveness, homeland and national security, and public health."

The biggest beneficiary of the NNI's budget, the National Science Foundation (NSF), would see a large increase again in the FY 2008 budget. NSF NNI support would increase by \$17 million to a level of \$390 million, a 4.5 percent increase. DOE would likewise see a substantial boost with a 13.0 percent, \$38 million gain, to \$332 million, and the National Institutes of Health would receive an increase of \$33 million, an 18.7 percent increase. On the other hand, NASA's share of the NNI budget would dip slightly after a huge 50 percent cut in FY 2007. The largest budgetary victim in FY 2008 would be DOD, which would see its nanotechnology research budget fall from \$417 million to \$375 million, a 10 percent decrease.

One of the areas that NNI is increasing investment in is research directed towards the societal aspects of nanotechnology and Environmental Health & Safety, funding for which has increased by 55 percent since the FY 2006 budget. This increase reflects the growing public concern about potential health effects of nanotechnology materials and standards are being developed to support responsible research, development and use of nanotechnology. (For detailed information on the NNI, see Chapter 23.)

NETWORKING AND INFORMATION TECHNOLOGY R&D (NITRD)

Another multi-agency research program of considerable importance is the Networking and Information Technology R&D Program (NITRD). Chartered in 1991 as a collaboration of federal agencies involved in fundamental high-end computer research, NITRD is composed of 14 member agencies and several informal participants. Through the

respective agencies, NITRD priorities for FY 2008 include projects such as developing and prototyping the next-generation high-end computing systems, advanced networking, developing future Internet architectures, development of advanced application software, particularly at the petascale level, and software for functional cyber security and information assurance.

Funding for NITRD is essentially flat at \$3.1 billion, an increase of 0.4 percent (see Table I-9). Health and Human Services would see the largest decrease in FY 2008, with a 14.4 percent or \$78 million cut to \$463 million. DOD's participation in NITRD would be cut by \$19 million, to \$1.0 billion, a 1.8 percent cut. These agencies would be the only two to suffer reductions for NITRD funding in FY 2008. NSF would be the big winner, with a \$90 million increase (up 10 percent). (See Table I-9 for funding details; for more on NITRD, see Chapter 22.)

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST is a non-regulatory federal agency within the Commerce Department, founded in 1901 with a mission to “develop and promote measurement, standards and technology to enhance productivity, facilitate trade and improve the quality of life.” Within NIST are the NIST intramural research laboratories, the Advanced Technology Program (ATP) and the Hollings Manufacturing Extension Program (MEP). The ATP mission is to “accelerate the development of innovative technologies that promise significant commercial payoffs and widespread benefits for the nation,” while the MEP is “a nationwide network of resources transforming manufacturers to compete globally, supporting greater supply chain integration, and providing access to technology for improved productivity.”

The NIST labs' budget for scientific and technical R&D would increase by 12.8 percent to a level of \$420 million, a \$47 million increase, because of the labs' inclusion in the ACI (see Table II-14). However, that good news is tempered by the Bush Administration's perennial effort to eliminate the ATP and drastically reduce funding for the MEP in its budget. The ATP is once again targeted for elimination (as it has been since 2001) from its current total budget of \$79 million. The non-R&D MEP would be cut by 55.7 percent to \$46 million. As it has in the past, Congress will most likely preserve funding for both of these programs again this year. (For more on NIST, please see Chapter 11.)