



OFFICE OF SCIENCE AND TECHNOLOGY POLICY
Executive Office of the President

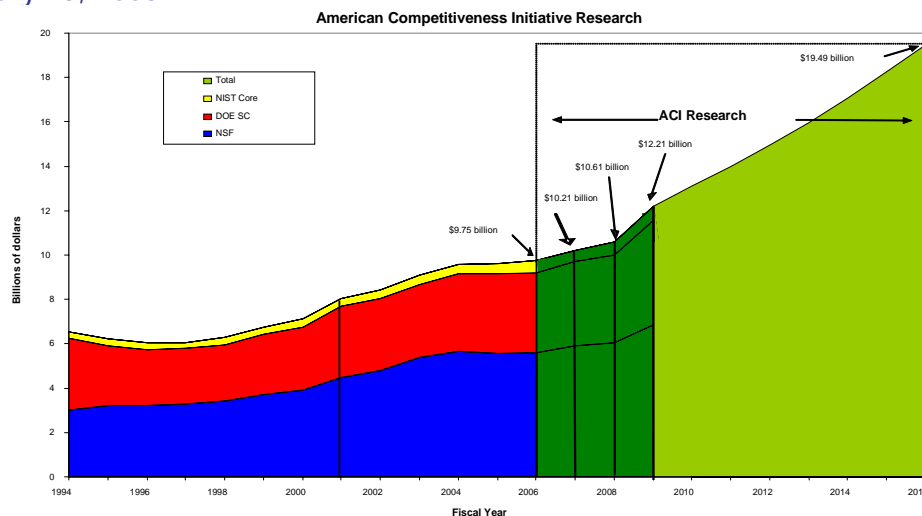
FY 2009 FEDERAL RESEARCH AND DEVELOPMENT BUDGET

February 4, 2008

The State of the Union

"To keep America competitive into the future, we must trust in the skill of our scientists and engineers and empower them to pursue the breakthroughs of tomorrow. Last year, Congress passed legislation supporting the American Competitiveness Initiative, but never followed through with the funding. This funding is essential to keeping our scientific edge. So I ask Congress to double federal support for critical basic research in the physical sciences and ensure America remains the most dynamic nation on Earth."

- President George W. Bush
United States Capitol
January 28, 2008



RESTORING THE ACI

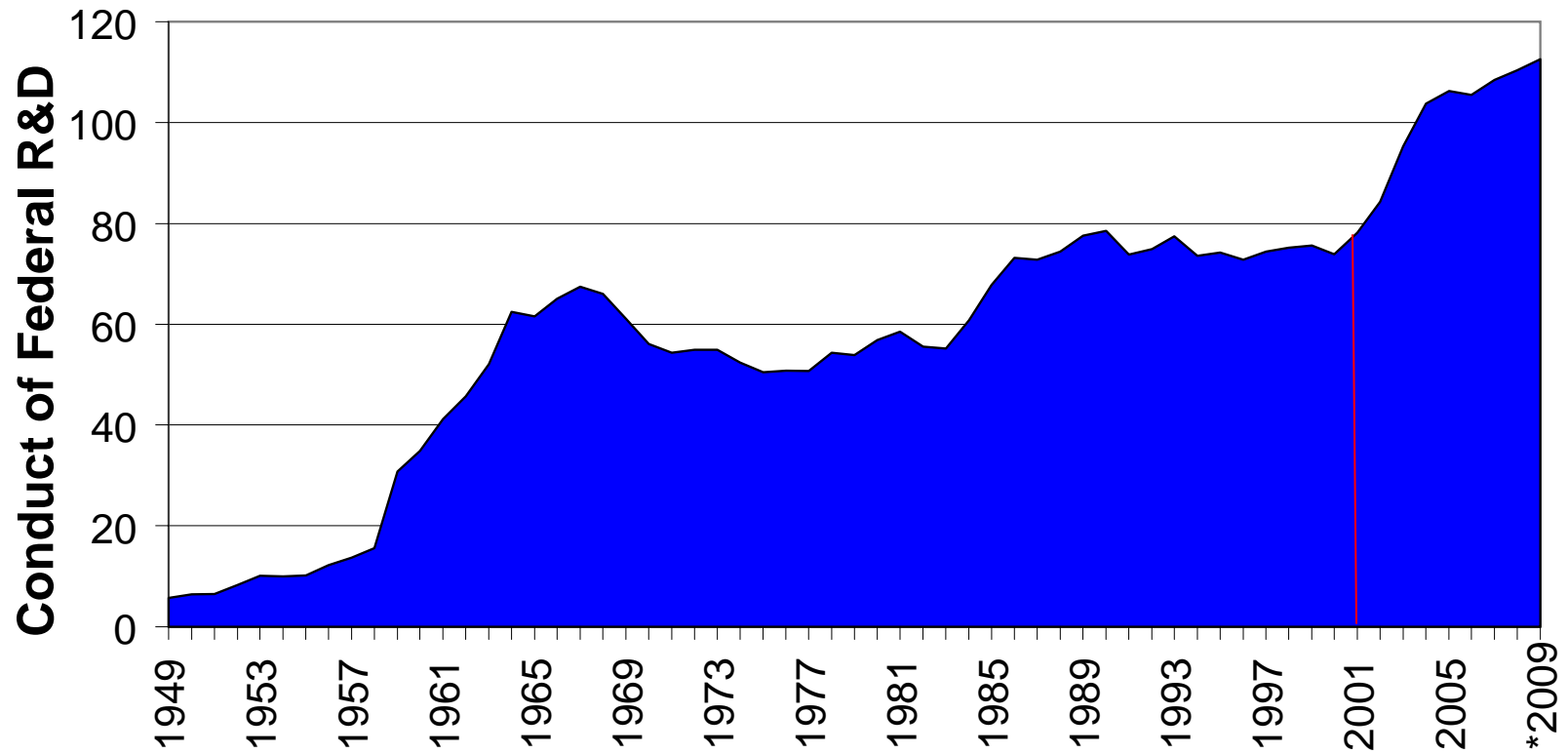
2009 FEDERAL R&D BUDGET HIGHLIGHTS

- In President Bush's 2009 Budget, total Federal R&D is \$147 billion, a record in real terms and an increase of \$3.9 billion (three percent) over FY 2008. This represents a 61% increase compared to 2001's \$91.3 billion.
- With this Budget, Federal R&D investment under this Administration will total over \$1 trillion, 42% more inflation-adjusted investment than the previous eight years.
- Non-defense R&D increases six percent in the 2009 Budget over FY 2008, compared to less than one percent for overall non-security discretionary spending.
- With the 2009 Budget, real growth in outlays for the conduct of non-defense R&D is up over 31% under this Administration, compared to less than 11% for the previous eight years.
- Non-defense R&D outlays are estimated to be 10.6% of total non-defense discretionary spending in 2009, compared to 10.5% in 2008 and 10.5% in 2001.
- Funding for basic research is \$29.3 billion in 2009, up from \$21.3 billion in 2001 – a 37% increase.
- Reinforcing the President's commitment to the American Competitiveness Initiative, which seeks to double investment in key civilian Federal science agencies (NSF, DoE Office of Science, NIST core) that support basic research in the physical sciences and engineering, the 2009 Budget calls for \$12.2 billion total, an overall funding increase of \$1.6 billion, or 15%.
- NSF is increased 13.6% (+\$822 million) to \$6.85 billion in 2009 and by 55% since 2001.
- DoE's Office of Science is increased 18.8% (+\$749 million) to \$4.72 billion in 2009 and by 48% since 2001.
- National Institute of Standards and Technology (NIST) "core" intramural research and facilities are increased 21.5% (+\$112 million) after

accounting for earmarks and unrequested grants to \$634 million in 2009 and by 83% since 2001.

- The President's 2009 Budget includes \$1.7 billion for DoD basic research, \$270 million more than requested in FY 2008 and 34% more than 2001.
- At more than \$3.5 billion in the President's 2009 Budget - double the 2001 investment - the cumulative effort in Networking and Information Technology R&D goes over the \$19.5 billion mark during the eight years of this Administration.
- Since FY 2001, nanotechnology R&D has more than tripled to over \$1.5 billion in 2009. The cumulative eight-year investment in the National Nanotechnology Initiative is nearly \$10 billion.
- The 2009 Budget includes \$3.2 billion for the Advanced Energy Initiative, a 25% increase over 2008 enacted level and \$1.4 billion more than the 2006 investment.
- At \$29.3 billion in 2009, NIH is \$8.9 billion or 43% higher than in 2001. NIH investment under this Administration totals \$222 billion, 66% more real investment in life science research than the previous eight years.
- 2009 funding for NASA is increased 2.9% overall from 2008. This includes \$4.44 billion for earth and space science, which is 17% more than in 2001.
- President Bush's 2009 Budget provides \$103 million and a total of \$910 million over five years for a series of NASA Earth observing missions that the National Research Council's recent "decadal survey" ranked as the top priorities for Earth sciences.
- The Climate Change Science Program (CCSP) exceeds \$2 billion in the 2009 Budget (12% more than FY 2008) for an eight-year total exceeding \$14.6 billion.

Federal R&D Spending (Outlays in billions, constant 2000 dollars)



*President's 2009 Budget

Federal Non-Defense R&D Spending (Outlays in billions, constant 2000 dollars)

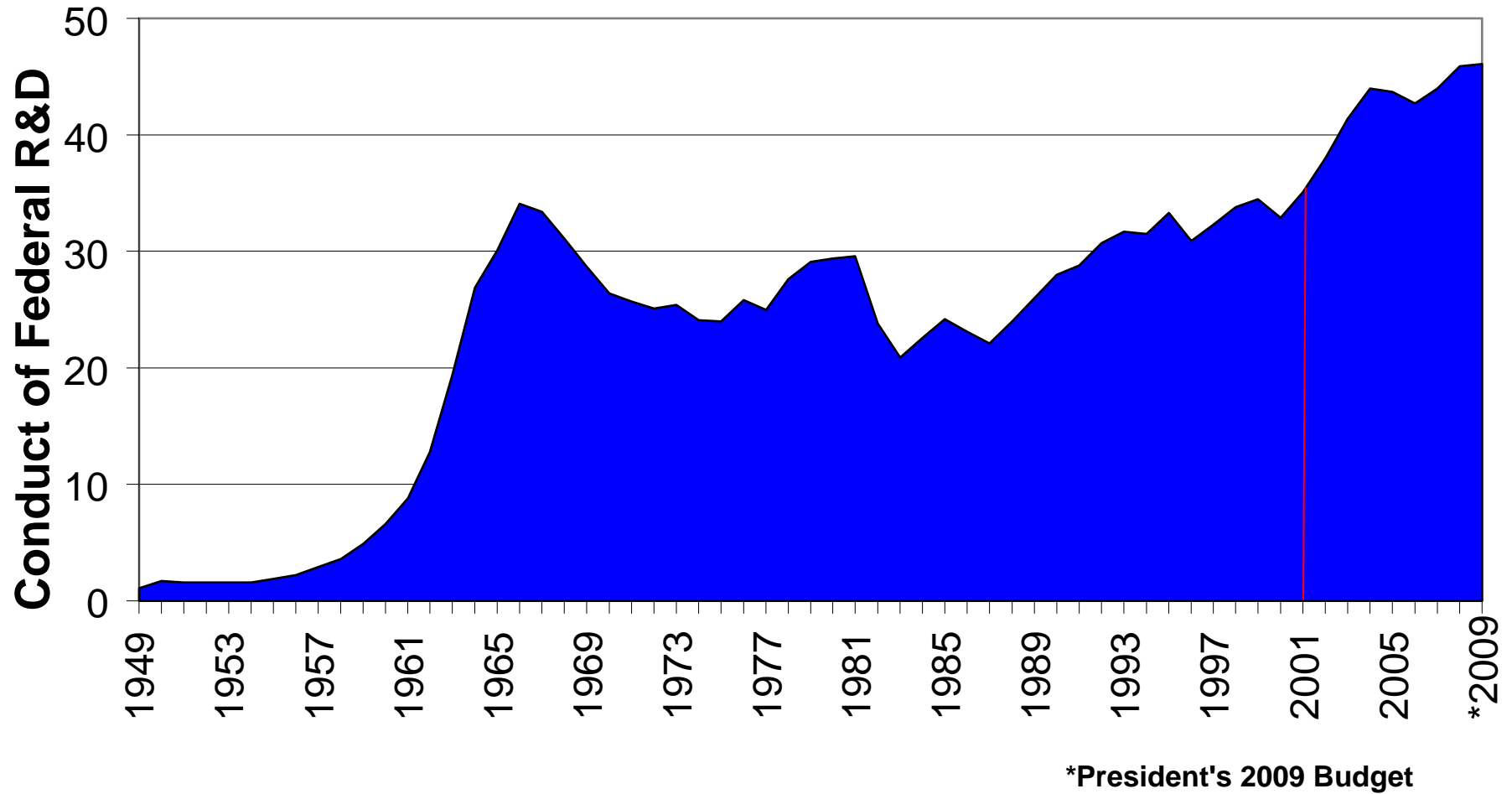


Table 5-1. FEDERAL RESEARCH AND DEVELOPMENT SPENDING

(Budget authority, dollar amounts in millions)

	2001 Actual	2008 Enacted	2009 Budget	Dollar Change: 2001 to 2009	Percent Change: 2001 to 2009
By Agency					
Defense	42,235	80,192	80,494	38,259	91%
Health and Human Services	21,037	29,475	29,480	8,443	40%
NASA	9,675	10,436	10,737	1,062	11%
Energy	7,772	9,739	10,558	2,786	36%
National Science Foundation	3,363	4,500	5,201	1,838	55%
Homeland Security	N/A	1,143	3,287	3,287	N/A
Agriculture	2,182	2,309	1,952	-230	-11%
Commerce	1,054	1,113	1,157	103	10%
Transportation	792	823	901	109	14%
Veterans Affairs	748	960	884	136	18%
Interior	622	676	617	-5	-1%
Environmental Protection Agency	598	557	550	-48	-8%
Other	1,186	1,140	1,145	-41	-3%
TOTAL	91,264	143,063	146,963	55,699	61%
Basic Research					
Defense	1,271	1,634	1,699	428	34%
Health and Human Services	11,601	15,897	15,884	4,283	37%
NASA	1,652	2,104	1,912	260	16%
Energy	2,390	3,232	3,556	1,166	49%
National Science Foundation	2,894	3,689	4,336	1,442	50%
Homeland Security	N/A	248	276	276	N/A
Agriculture	801	856	798	-3	0%
Commerce	50	96	176	126	252%
Transportation	17	3	3	-14	-82%
Veterans Affairs	301	385	354	53	18%
Interior	56	43	40	-16	-29%
Environmental Protection Agency	105	97	95	-10	-10%
Other	192	188	190	-2	-1%
SUBTOTAL	21,330	28,472	29,319	7,989	37%
Applied Research					
Defense	3,673	5,058	4,245	572	16%
Health and Human Services	9,064	13,414	13,424	4,360	48%
NASA	2,533	974	919	-1,614	-64%
Energy	2,330	3,513	3,474	1,144	49%
National Science Foundation	181	340	422	241	133%
Homeland Security	N/A	382	381	381	N/A
Agriculture	1,045	1,103	922	-123	-12%
Commerce	768	731	737	-31	-4%
Transportation	445	576	614	169	38%
Veterans Affairs	432	519	478	46	11%
Interior	534	549	513	-21	-4%
Environmental Protection Agency	370	379	370	0	0%
Other	585	574	588	3	1%
SUBTOTAL	21,960	28,112	27,087	5,127	23%

Table 5-1. FEDERAL RESEARCH AND DEVELOPMENT SPENDING ---Continued

(Budget authority, dollar amounts in millions)

	2001 Actual	2008 Enacted	2009 Budget	Dollar Change: 2001 to 2009	Percent Change: 2001 to 2009
Development					
Defense	37,270	73,358	74,393	37,123	100%
Health and Human Services	107	22	22	-85	-79%
NASA	2,698	5,436	5,731	3,033	112%
Energy	2,042	2,232	2,472	430	21%
National Science Foundation	0	0	0	0	N/A
Homeland Security	N/A	365	380	380	N/A
Agriculture	152	195	186	34	22%
Commerce	170	76	68	-102	-60%
Transportation	247	225	264	17	7%
Veterans Affairs	15	56	52	37	247%
Interior	32	62	62	30	94%
Environmental Protection Agency	101	81	85	-16	-16%
Other	396	324	298	-98	-25%
SUBTOTAL	43,230	82,432	84,013	40,783	94%
Facilities and Equipment					
Defense	21	142	157	136	648%
Health and Human Services	265	142	150	-115	-43%
NASA	2,792	1,922	2,175	-617	-22%
Energy	1,010	762	1,056	46	5%
National Science Foundation	288	471	443	155	54%
Homeland Security	N/A	148	2,250	2,250	N/A
Agriculture	184	155	46	-138	-75%
Commerce	66	210	176	110	167%
Transportation	83	19	20	-63	-76%
Veterans Affairs	0	0	0	0	N/A
Interior	0	22	2	2	N/A
Environmental Protection Agency	22	0	0	-22	N/A
Other	13	54	69	56	431%
SUBTOTAL	4,744	4,047	6,544	1,800	44%

Federal Science and Technology Budget

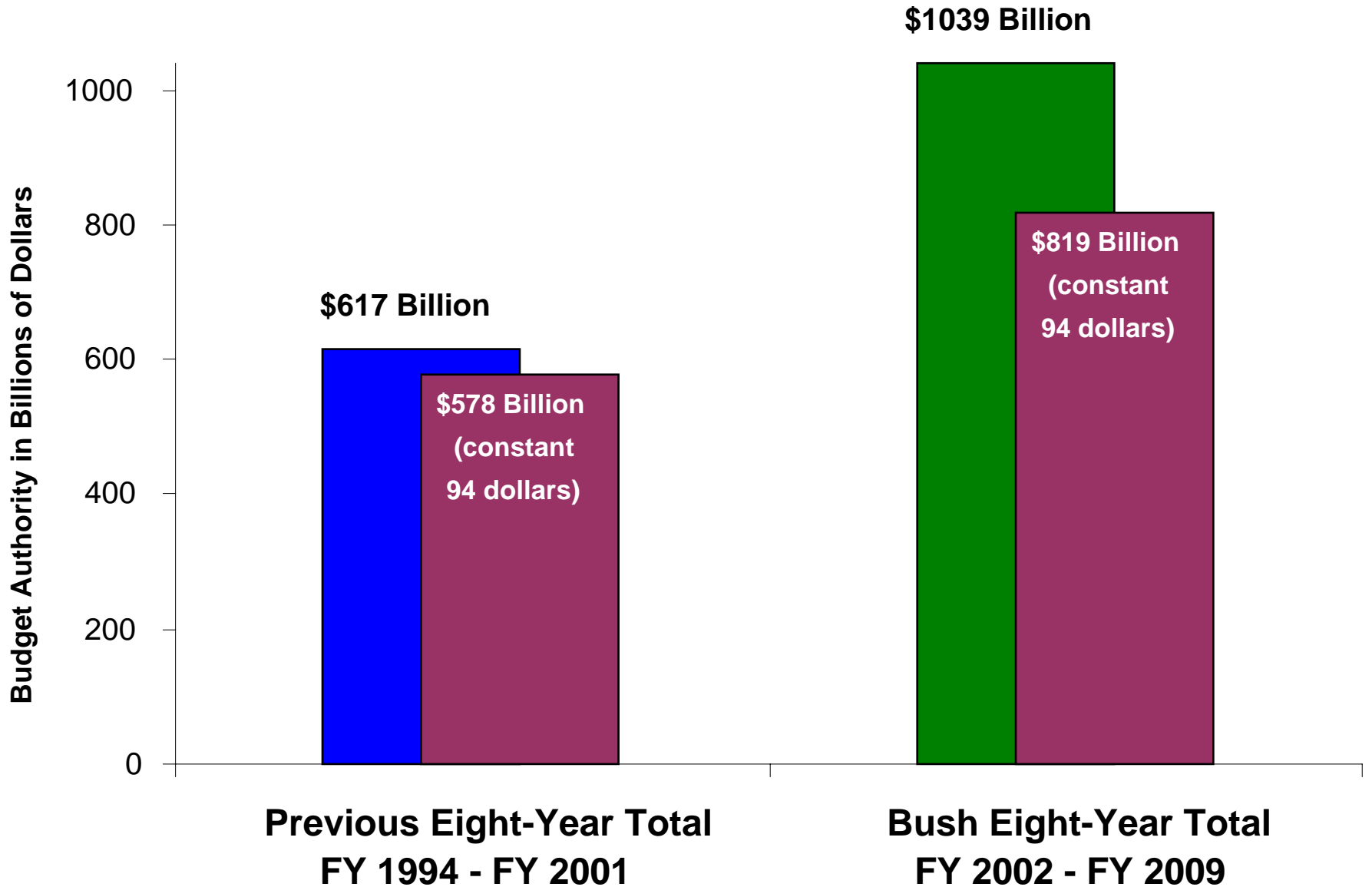
(Budget Authority, dollar amounts in millions)

	2001 Actual	2008 Enacted	2009 Budget	Dollar Change: 2001 to 2009	Percent Change: 2001 to 2009
FS&T Total	45,725	61,924	61,770	16,045	35.1%
National Institutes of Health	20,361	29,307	29,307	8,946	44%
Energy [1]	4,886	7,226	7,627	2,741	56%
Science Programs	3,218	3,973	4,722	1,504	47%
Electricity Transmission & Distribution	56	110	100	44	79%
Nuclear Energy	238	962	854	616	259%
Energy Efficiency and Renewable Energy Resources [2]	931	1,440	1,197	266	29%
Fossil Energy [3]	443	741	754	311	70%
National Science Foundation	4,431	6,032	6,854	2,423	55%
Defense	4,944	6,692	5,944	1,000	20%
Basic Research	1,271	1,634	1,699	428	34%
Applied Research	3,673	5,058	4,245	572	16%
NASA	5,508	5,911	5,517	9	0%
Science	4,371	4,627	4,442	71	2%
Aeronautics	975	505	447	-528	-54%
Exploration Systems [4]	N/A	654	452	452	N/A
Innovative Partnerships	162	125	176	14	9%
Agriculture	1,765	2,156	1,921	156	9%
CSREES Research & Education [5]	514	672	539	25	5%
Economic Research Service	69	77	82	13	19%
Agricultural Research Service [6]	936	1,121	1,037	101	11%
Forest Service: Forest and Rangeland Research	246	286	263	17	7%
Commerce	662	1,003	1,012	350	53%
NOAA: Oceanic & Atmospheric Research	315	398	378	63	20%
NIST Intramural Research and Facilities	347	605	634	287	83%
Interior (USGS)	884	1,006	969	85	10%
Veterans Affairs [7]	719	891	884	165	23%
Environmental Protection Agency [8]	746	786	790	44	6%
Transportation	521	577	601	80	15%
Highway Research: Federal Highway Administration [9]	387	430	430	43	11%
Federal Aviation Administration: Research, Engineering, and Development	134	147	171	37	28%
Education	298	337	344	46	15%
Special Education Research and Innovation	77	71	71	-6	-8%
National Institute on Disability and Rehabilitation Research	100	106	106	6	6%
Research, Development, and Dissemination [10]	121	160	167	46	38%

- Notes:
- [1] Data do not reflect actual transfers to Science Programs from other Department of Energy R&D programs to support the Small Business Innovation Research and the Small Business Technology Transfer programs.
 - [2] Excludes Weatherization, State grants, and intergovernmental activities.
 - [3] Excludes funding for the Alaska Natural Gas Pipeline project.
 - [4] Exploration Systems includes the Exploration Technology Development Program, the Human Research Program, and the Lunar Precursor Robotic Program.
 - [5] Includes the appropriation of earnings from the Native American Endowment Fund, but not the appropriation to the Endowment's principal.
 - [6] Excludes building and facilities. Also excludes the transfer of \$3 million to the account in 2007.
 - [7] Includes the medical care and prosthetic research appropriation and research support from the VA medical care appropriations. In 2008, \$69 million in emergency funding provided to the Medical and Prosthetics Research account by the Consolidated Appropriations Act of 2008.
 - [8] Science and Technology, plus superfund transfer.
 - [9] According to the process established in section 1102(f) of SAFETEA-LU, FHWA annually adjusts research funding level from the appropriated obligation limitation.
 - [10] Does not include funding for Regional Educational Labs.

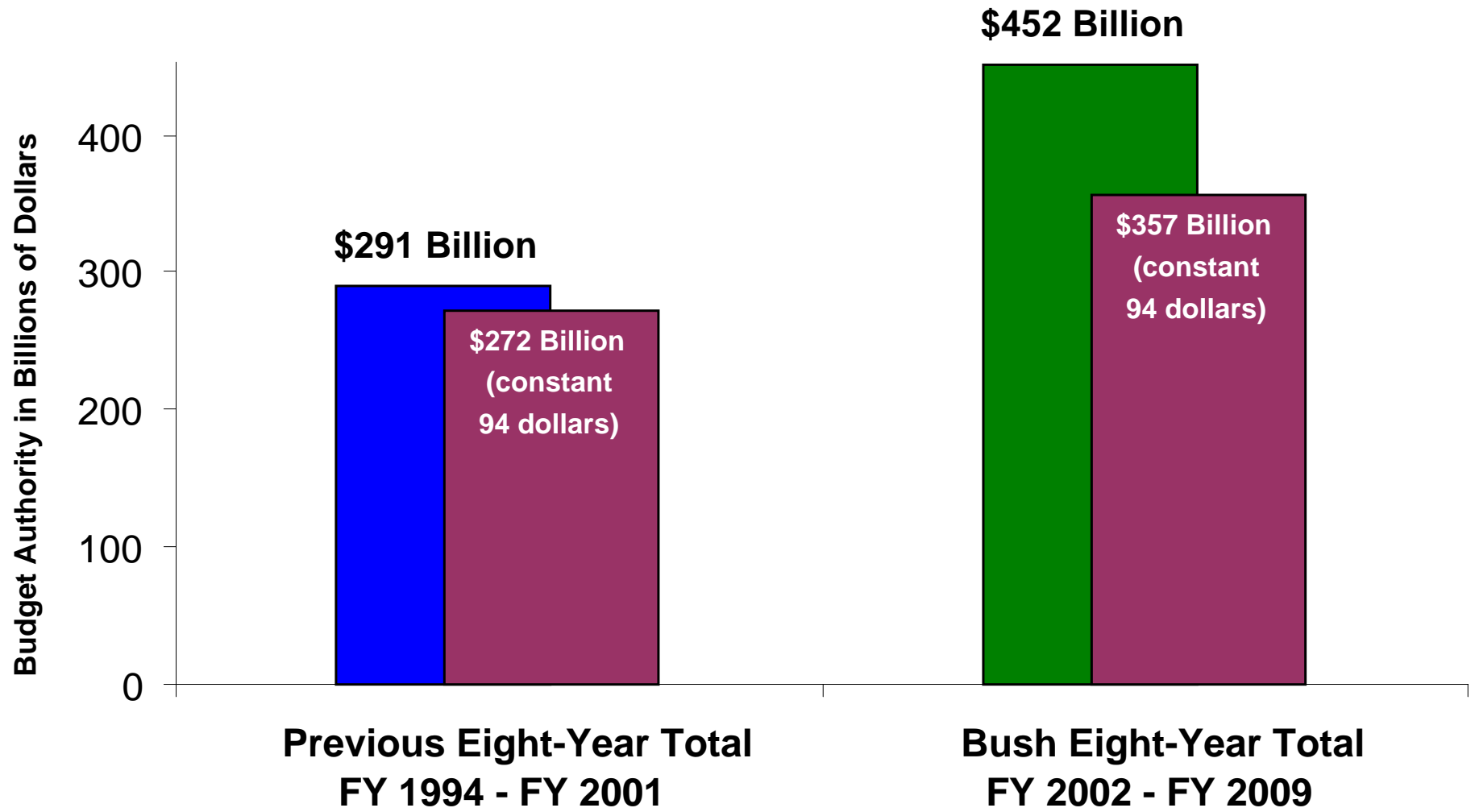
Federal Research and Development

42% More Real Investment



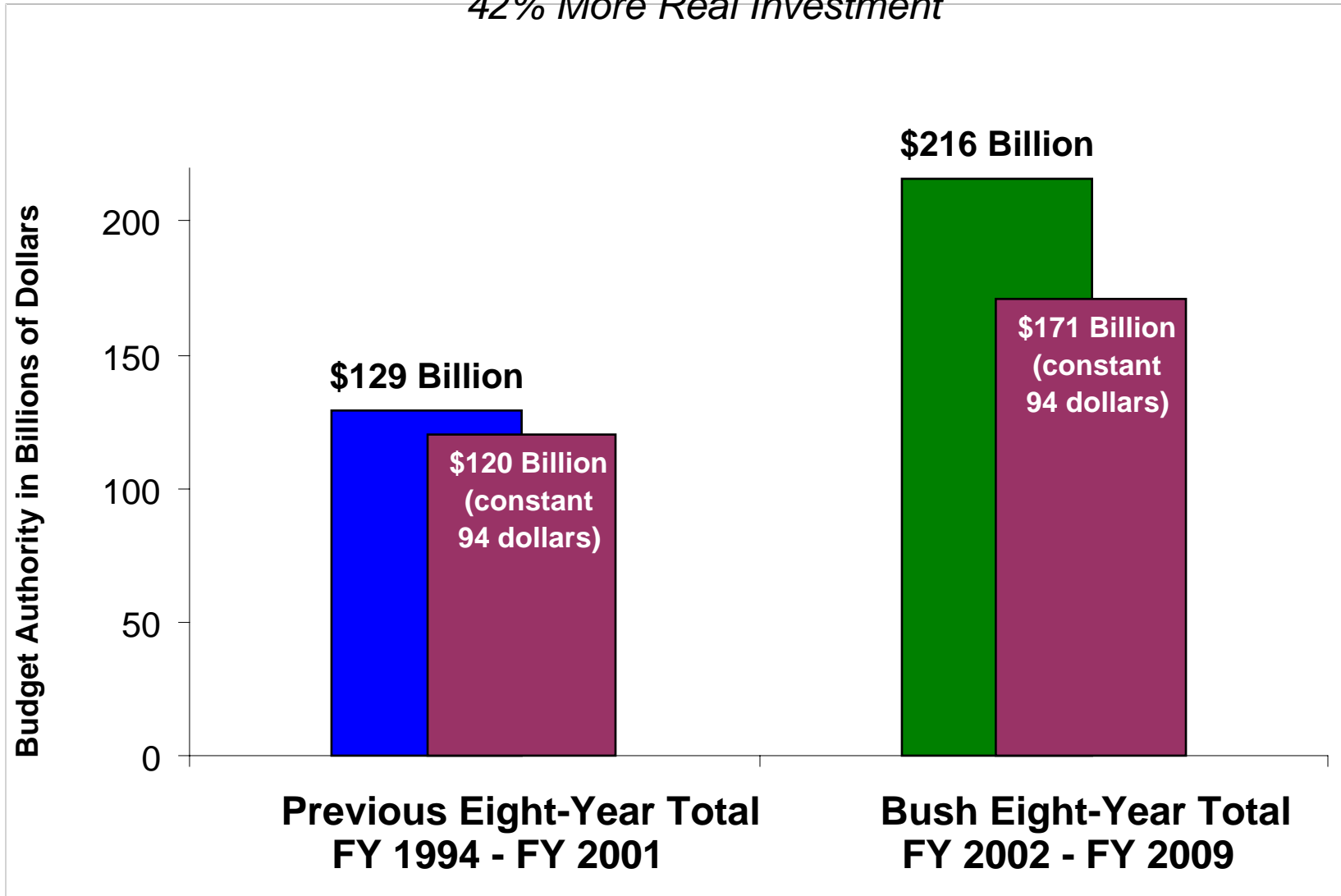
Civilian Research and Development

31% More Real Investment



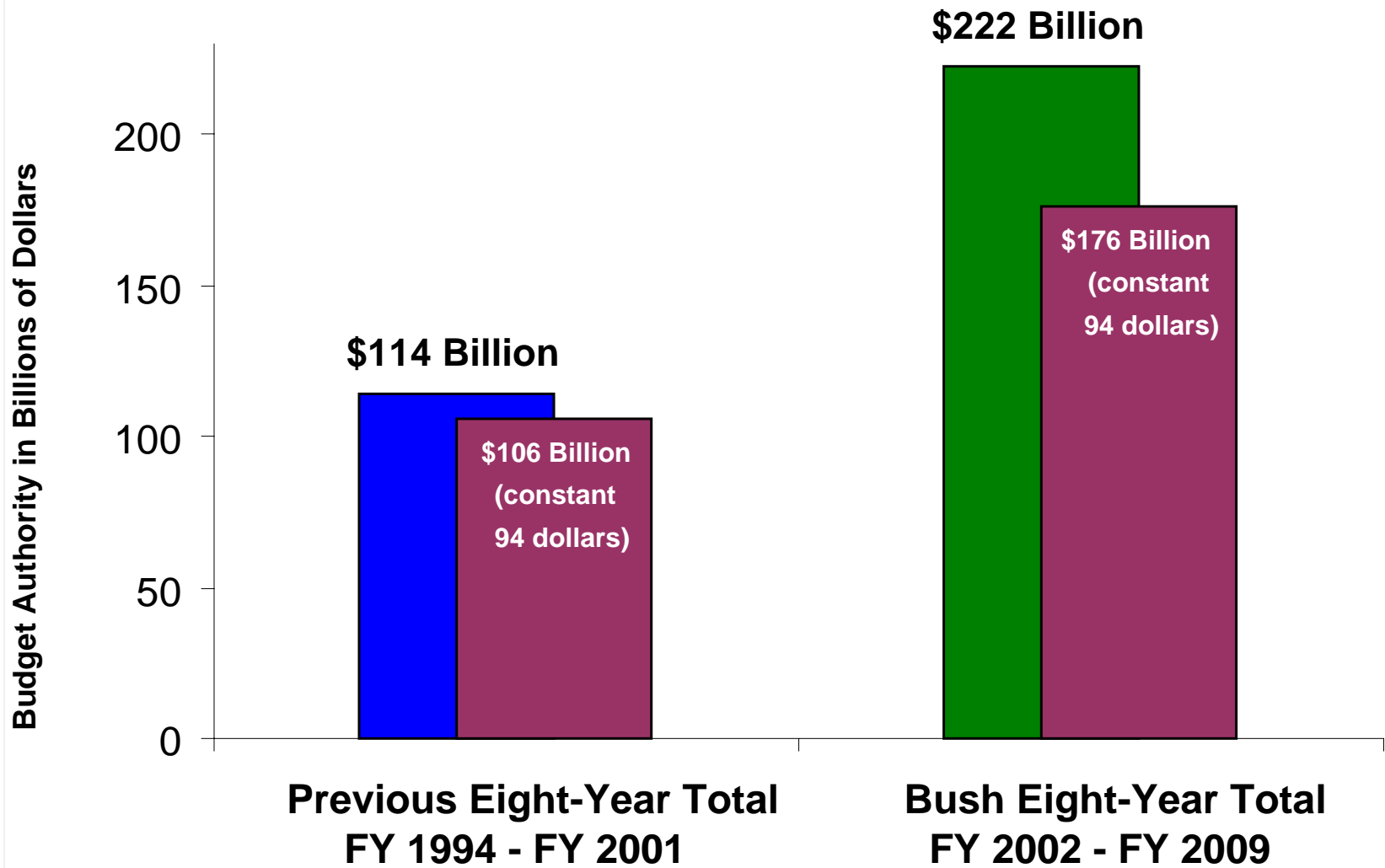
Basic Research

42% More Real Investment



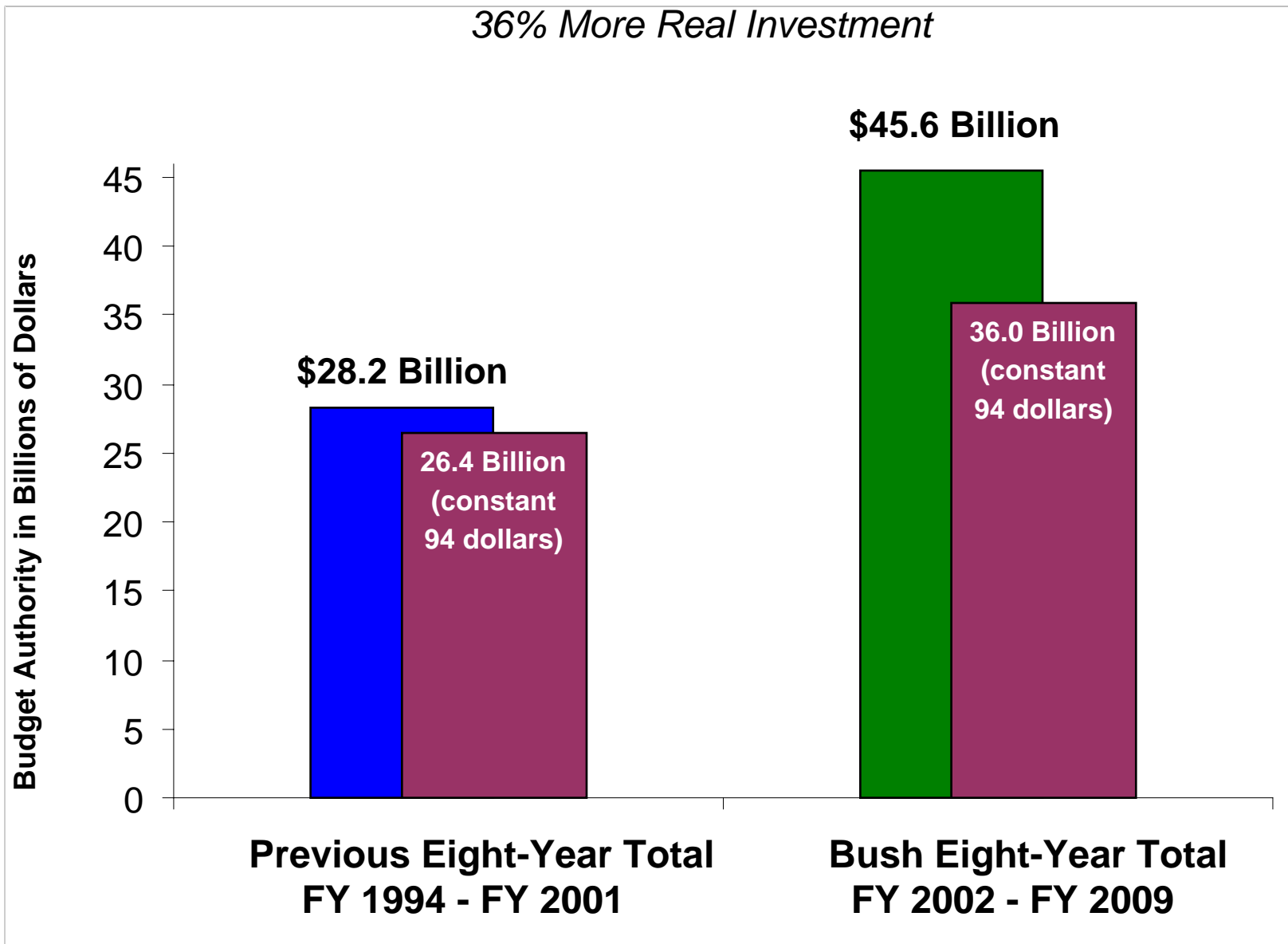
National Institutes of Health

66% More Real Investment



National Science Foundation

36% More Real Investment





AMERICAN COMPETITIVENESS INITIATIVE (ACI) *Research and Development Funding in the President's 2009 Budget*

For the third straight year, President Bush prioritizes basic research in the physical sciences to advance knowledge and technologies used by scientists in nearly every field. Through the ACI, the President is implementing his plan to double, over 10 years, investment in innovation-enabling research at three key civilian Federal science agencies—the National Science Foundation (NSF), the Department of Energy's Office of Science (DoE SC), and the Department of Commerce's National Institute of Science and Technology laboratory research and facilities (NIST Core).

In FY 2009, year three of the ACI, President Bush proposes \$12.2 billion total for NSF, DOE SC, and NIST Core, a funding increase of \$1.6 billion, or 15 percent, above the 2008 enacted total of \$10.6 billion. Unfortunately, the 2008 omnibus appropriations bill drastically cut proposed ACI research, funding only one-third of the President's requested increase. In addition, Congress directed over half of the enacted increase (\$207 million of a total \$408 million increase) to earmarks and an unrequested new grants program. This is deeply disappointing and significantly impairs and delays the Administration's efforts to strengthen long-term U.S. economic growth and competitiveness. President Bush's call for doubling these basic research levels had been endorsed by Congress, which fully authorized his ACI research increases in the bipartisan America COMPETES Act (Public Law 110-69), and are roundly supported by a broad coalition of business and academic leaders in the "American Innovation Proclamation" (<http://futureofinnovation.org/media/Proclamation-FINAL.pdf>). The President's FY 2009 Budget returns ACI research to a doubling path to ensure this consensus national priority objective is realized.

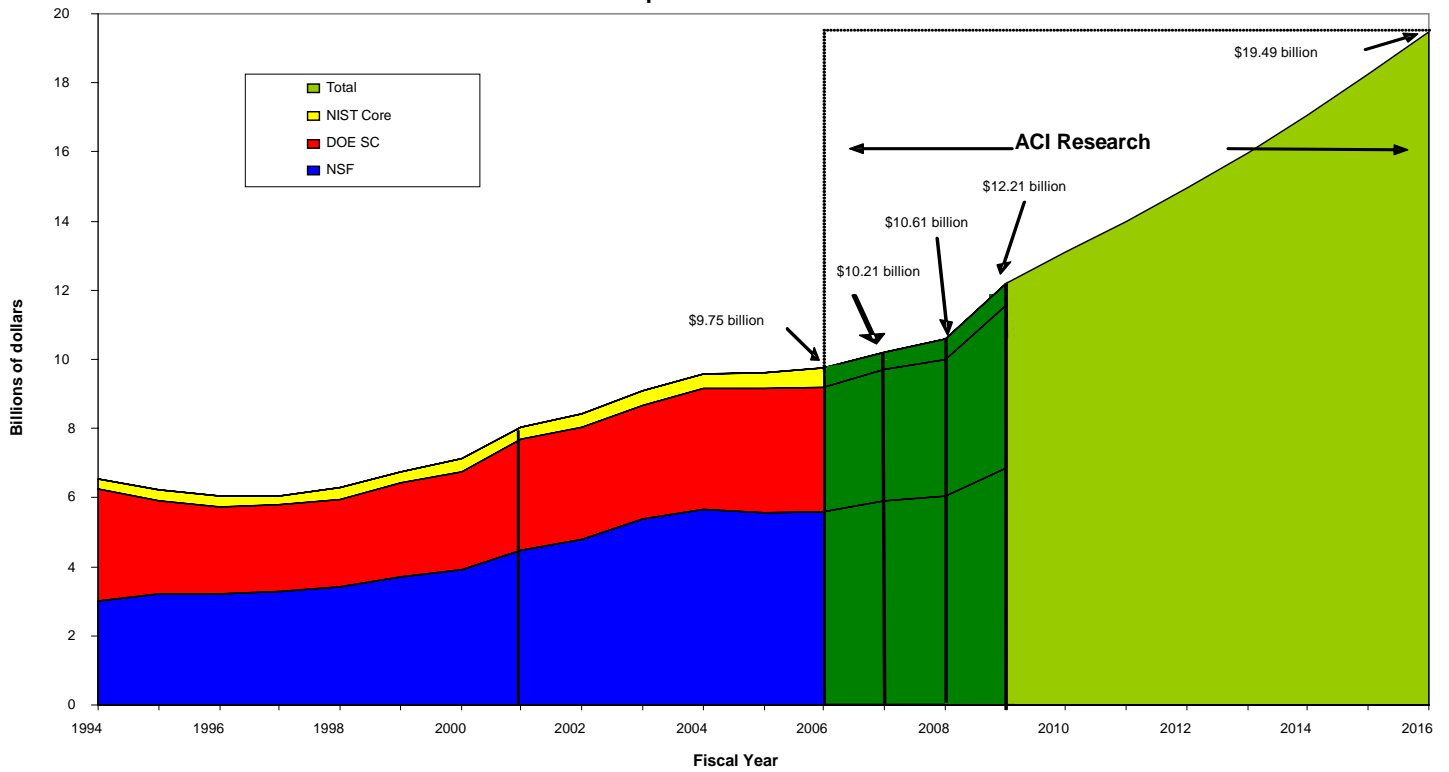
Research Agencies in the American Competitiveness Initiative

The National Science Foundation is the primary source of support for academic research in the physical sciences, funding basic research in areas such as nanotechnology, advanced networking and information technology, physics, chemistry, materials science, mathematics, and engineering. It is also well regarded for funding nearly all of its research through a competitive, peer-reviewed process. The increase in NSF funding will support many more researchers, students, post-doctoral fellows and technicians contributing to the innovation enterprise.

The Department of Energy's Office of Science supports grants and infrastructure for a wide range of basic research impacting economically significant areas such as nanotechnology, biotechnology, high-end computing, advanced networking, as well as energy production and use. The 2009 Budget increases funding for both research and cutting-edge facilities. Strategic basic research for electrical energy storage and an advanced nuclear fuel cycle will be accelerated, and the radioisotope production and application programs will be reorganized and reformed. The Budget expands supercomputing facilities and related research, and dedicates significant resources to climate change modeling and other scientific simulations. It starts construction of a world-leading next generation light source and upgrades a nuclear physics accelerator. And the Budget meets the United States' contribution to the international fusion energy project known as ITER.

The Department of Commerce's National Institute of Standards and Technology (NIST) invests in technological innovation through research and standards development. These investments will improve NIST's research capabilities by providing high performance laboratory space for diverse research fields and world-class researchers; aid the responsible development of nanotechnology manufacturing; expand NIST's neutron facility to aid in characterizing novel materials in high-growth research fields; and improve our understanding of complex biological systems to accelerate innovations and enable investment in biosciences, including disease diagnosis and treatment.

American Competitiveness Initiative Research



	FY 2006 Actual	FY 2007 Actual	FY 2008 Enacted	FY 2009 ACI Request		
	(billions of dollars)	(billions of dollars)	(billions of dollars)	(billions of dollars)	% Increase Over FY08	% Increase Over FY06
NSF	\$5.58	\$5.92	\$6.03	\$6.85	13.6	22.8
DoE SC	\$3.60	\$3.80	\$3.97	\$4.72	18.9	31.3
NIST Core	\$0.57 ¹	\$0.49	\$0.60 ²	\$0.63	4.8 ³	11.6 ⁴
TOTAL	\$9.75	\$10.21	\$10.61	12.21	15.1	25.3

¹ The 2006 actual level for NIST Core includes \$137 million in earmarks.

² The 2008 enacted level for NIST Core includes \$83 million in earmarks and unrequested grants.

³ Represents a 21.5 percent increase after accounting for earmarks and unrequested grants.

⁴ Represents a 47.1 percent increase after accounting for earmarks.



Research Earmarks

Research and Development Funding in the President's 2009 Budget

President Bush challenges Congress to clean up its earmarking practice by implementing a series of reforms that require full disclosure and open debate for any earmark and cutting the total number and cost of all earmarks by at least half. Appropriations bills that defy these conditions will be vetoed and earmarks that are not voted on and approved by Congress will be ignored by their agency. Consistent with this reform effort, the Administration is continuing its strong support for awarding research funds based on merit review through a competitive process refereed by scientists themselves. Such a system has the best prospects for ensuring that the highest quality research is supported. Research earmarks—in general the assignment of money during the legislative process for use by a specific organization or project—are counter to a merit-based competitive selection process that has been a hallmark of American scientific prowess since the post World War II era. However, over the past 20 years, the number of earmarks has risen dramatically and threatens to undermine a vital process underpinning U.S. scientific greatness. Earmarks signal to potential investigators that there is an acceptable alternative to creating quality research proposals that can pass muster with other highly-qualified scientists or engineers. Such an alternative can be an ineffective use of taxpayer funds.

Unfortunately, the practice of earmarking funds to colleges, universities, and other entities for specific research projects returned, and actually expanded, last year. In FY 2008, DoD basic and applied research earmarks total about \$1.1 billion (about 1/5 of the total); \$124 million of the DoE Office of Science is earmarked; and \$83 million in earmarks and unrequested grants seriously dilute the core research and facilities proposed at the National Institute of Standards and Technology. Altogether, research earmarks are estimated at nearly \$2 billion of the \$16.8 billion of overall appropriations earmarks government-wide in FY 2008. This is more than the nominal increase of \$1.8 billion to the Federal Science & Technology budget compared to 2007 and is a real cut in merit-reviewed research. To maximize the effectiveness of federally-funded research, the President calls upon Congress and the academic community to renounce research earmarks.

Some argue that earmarks help spread research money to states or institutions that would receive less research funding through other means. However, The Chronicle of Higher Education has reported that this is not the main role earmarks play. Often only a minor portion of academic earmark funding goes to the states with the smallest shares of Federal research funds. Some proponents of earmarking also assert that earmarks provide a means of funding unique projects that would not be recognized by the conventional peer-review process. To address this concern, a number of research agencies have procedures and programs to reward “out-of-the-box” thinking. For example, the Defense Advanced Research Projects Agency, within the Department of Defense, seeks out high-risk, high-payoff scientific proposals, the National Institutes of Health has established a similarly focused “Pioneer Award,” and program managers at NSF set aside a share of funding for higher-risk projects in which scientists and engineers see high potential.

Earmarks for activities that are outside of an agency's mission can detract from an efficient and effective Federal effort on behalf of taxpayers. For instance, in 2008, the Congress has directed DoD to fund research on a wide range of diseases including diabetes, autism, and muscular dystrophy. Funding for unrequested medical research projects in DoD's budget totals about \$800 million in 2008 alone. While research on these diseases is very important, these diseases are not unique to the U.S. military and the research could be better selected, carried out and coordinated within civil medical research agencies without disruption to the military mission. At the same time, intrusion of earmarks into the peer-review processes of civilian medical research agencies would have a significant detrimental impact on ensuring that the most important and promising research is chosen by medical research professionals with access to information on the most promising research opportunities.

Earmarks that divert funding from a merit-based process undermine America's research productivity. The Administration commends Congress for not subjecting NSF and the National Institutes of Health to this debilitating practice. It is now time to end this practice for all R&D programs.



NETWORKING AND INFORMATION TECHNOLOGY
Research and Development Funding in the President's FY 2009 Budget

President Bush's FY 2009 Budget of \$3.5 billion for Networking and Information Technology R&D (NITRD) represents a doubling (101% increase) since 2001. This brings total investment in this area during this Administration to more than \$20.9 billion. The 2009 Budget emphasizes the President's American Competitiveness Initiative (ACI) by providing increases over 2008 funding in NITRD for all three ACI agencies, the National Science Foundation (NSF), DoE's Office of Science (DoE SC), and DoC's National Institute of Standards and Technology. The tools and capabilities that result from research in networking and advanced information technologies affect every area of science and technology and enhance the Nation's competitiveness.

Networking and Information Technology Research and Development (dollars in millions)

Department/Agency	2001 Actual	2008 Funding	2009 Budget	Dollar Change: 2001 to 2009	Percent Change: 2001 to 2009
Defense*	\$310	\$1,250	\$1,237	\$927	299%
National Science Foundation	\$636	\$931	\$1,090	\$454	71%
Health and Human Services	\$277	\$556	\$555	\$278	100%
Energy	\$326	\$436	\$494	\$168	52%
NASA**	\$177	\$72	\$71	-\$106	-60%
Commerce	\$38	\$85	\$90	\$52	137%
Environmental Protection Agency	\$4	\$6	\$6	\$2	50%
National Archives & Records Admin***	—	\$5	\$5	\$5	—
TOTAL	\$1,768	\$3,341	\$3,548	\$1,780	101%

* Includes research areas not reported as NITRD in 2001; includes research by military services not reported in 2001

** NASA has modified how it accounts for costs so the 2001 numbers on this line are not fully comparable

*** NARA is a new member of the NITRD Program, so no 2001 number is available

The Department of Defense IT R&D investment to support the nation's defense is the largest share of the NITRD Program, followed by NSF with over \$1 billion of NITRD funding to support NSF's mission of funding fundamental research in science and engineering. Active coordination of all NITRD research activities promotes accelerated progress on some of the Nation's highest priorities, including defense, homeland security, energy independence and enhanced economic competitiveness.

High-end computing (HEC) continues to be a high priority for the NITRD Program. The 2009 Budget substantially strengthens investment in both HEC infrastructure and HEC R&D, and maintains the path for DoE DOE SC and NSF to deploy petascale computing systems by the end of the decade as recommended in the 2004 *Federal Plan for High-End Computing*.

Advanced networking research is another area of increase for the NITRD Program in FY 2009, ensuring that large-scale networking technologies will keep pace with the rapid development of petascale computing systems, so that the results of petascale computations are immediately accessible for analysis. The resulting network technologies will also directly contribute to US competitiveness.

The 2009 Budget also emphasizes a third NITRD Program priority, cyber security and information assurance. The increased investments in basic research related to cyber security in FY 2009 are intended to respond to the need for an information infrastructure that is more flexible, resilient, and reliable. Improving the security of the Nation's information infrastructure is essential as it is used both by the U.S. Government and its citizens for providing an increasing array of information and financial services.



NATIONAL NANOTECHNOLOGY INITIATIVE
Research and Development Funding in the President's 2009 Budget

The President's 2009 Budget provides over \$1.5 billion for the multi-agency National Nanotechnology Initiative (NNI), over three times the level of investment at the beginning of this Administration, bringing the total since the NNI was established in 2001 to nearly \$10 billion. This sustained investment is advancing our understanding of the unique phenomena and processes that occur at the nanometer scale and expediting the responsible use of this knowledge to achieve advances in medicine, manufacturing, information technology, and energy and environmental technologies.

The NNI comprises research on and development of novel materials, devices, and systems that exploit the fundamentally distinct properties of matter as it is manipulated at the atomic and molecular levels. NNI-supported R&D results are already leading to breakthroughs in disease detection and treatment, manufacturing at the nanoscale level, environmental monitoring and protection, energy production and storage, and creating electronic and computing devices that have even greater capabilities than those available today.

Guided by the 2007 NNI Strategic Plan, participating agencies will continue to support the broad spectrum of discovery, development and application of nanotechnology through investigator-led fundamental and applied research; multidisciplinary centers of excellence; education and training of nanotechnology researchers, teachers, workers, and the public; critical infrastructure, including user facilities and networks that are broadly available to support research and innovation; and standards development. In addition, agencies continue to maintain a focus on the responsible development of nanotechnology, with attention to the potential human and environmental health impacts, as well as ethical, legal, and other societal issues.

These activities will be appropriately coordinated with stakeholders outside of the Federal government, including industry, academia, and other governments. Agency investments in nanotechnology R&D are informed by the National Science and Technology Council's Nanoscale Science, Engineering, and Technology Subcommittee and by outside reviews by the President's Council of Advisors on Science and Technology and the National Research Council. Reports of these Federal and non-Federal bodies help to identify and prioritize research, including in the area of environmental, health, and safety aspects of nanotechnology. Information about the NNI is available at www.nano.gov.

National Nanotechnology Initiative (dollars in millions)					
Department/Agency	2001 Actual	2008 Funding	2009 Budget	Dollar Change: 2001 to 2009	Percent Change: 2001 to 2009
DoD	\$125	* \$487	\$431	\$306	245%
NSF	\$150	\$389	\$397	\$247	165%
DoE	\$88	\$251	\$311	\$223	253%
HHS/NIH	\$40	\$226	\$226	\$186	465%
DoC/NIST	\$33	\$89	\$110	\$77	233%
NASA**	\$22	\$18	\$19	-\$3	-14%
EPA	\$5	\$10	\$15	\$10	200%
HHS/NIOSH	\$0	\$6	\$6	\$6	-
USDA	\$0	\$11	\$8	\$8	-
DoJ	\$1	\$2	\$2	\$1	0%
DHS	\$0	\$1	\$1	\$1	-
DoT/FHWA	\$0	\$1	\$1	\$1	-
TOTAL	\$464	\$1,491	\$1,527	\$1,063	229%

Agencies funding research on the human and environmental health implications of nanotechnology and methods for managing potential risks include EPA, NIH, NIOSH, NIST, NSF, DoE, DoD, and USDA.

2008 and 2009 funding levels for: DoE includes the Offices of Science, Fossil Energy, and Energy Efficiency and Renewable Energy; and USDA includes Cooperative State Research, Education, and Extension Services, and the Forest Service.

* The 2008 DoD estimate exceeds the 2008 request by \$112 million but includes many Congressional earmarks that are outside the NNI plan.

** NASA has modified how it accounts for costs so the 2001 numbers on this line are not fully comparable.



PHYSICAL SCIENCES AND ENGINEERING

Research and Development Funding in the President's 2009 Budget

The President's 2009 Budget continues to emphasize the priorities of the American Competitiveness Initiative, including substantial investments in the physical sciences and engineering. This sustained investment in basic research enables the innovation that drives the Nation's economy in high priority areas such as new energy technology, nanotechnology, advanced networking and supercomputing, space exploration and earth and ocean observations and research. Budget increases for the Department of Energy's Office of Science, National Science Foundation, and National Institute of Standards and Technology fund the machinery of science with the broadest impact, while continued investment in high energy physics and astronomy will provide new insights into the nature of matter, energy, space and time. Critical increases are also needed to ensure and enhance our ongoing observation and monitoring of the planet and its climate, from the oceans to the atmosphere, to provide essential insight into the changes going on around us and our ability to affect those changes.

Department of Energy – The 2009 Budget provides \$4.7 billion for DOE's Office of Science, an increase of 18.8% over the 2008 funding level. The Budget includes funding for priorities such as construction of research facilities, including the National Synchrotron Light Source II (\$93.3 million), ITER (\$214.5 million), the Linear Coherent Light Source (\$37 million), and the Continuous Electron Beam Accelerator Facility (\$28.6 million), as well as critical infrastructure such as the isotope production and application program. This Budget also supports accelerated basic research in hydrogen, solar energy utilization, electrical energy storage, advanced nuclear energy systems, carbon sequestration and other use-inspired focus areas. Larger investments in Advanced Scientific Computing Research are also proposed, with increased support for climate research and modeling at DOE Supercomputing Facilities.

National Science Foundation – The President's Budget provides \$6.9 billion for NSF, an increase of 13% from 2008 levels. Included in this amount is \$1.4 billion for the Math and Physical Sciences Directorate, an increase of 20%, in addition to increased spending on Engineering (20%), Computing and Information Science and Engineering (19%), and in Geosciences (13%). The Budget also supports cross-agency investments in Cyber-enabled Discovery and Innovation, Science and Engineering Beyond Moore's Law and Adaptive Systems Technology.

Department of Commerce – A high priority for 2009, the President's Budget provides \$635 million for the National Institute of Standards and Technology. After correcting the 2008 budget by excluding \$83 million in earmarks and unrequested grants, this Budget represents an increase of over 20% to core NIST funding for basic research and construction of research facilities. The requested budget increases critical capacity for nanoscale material characterization and development of instrumentation and methodologies that are enabling for nanotechnology applications. The request for DOC also includes \$18 million in additional funding to support ocean research and technology development and ocean observing at NOAA.

National Aeronautics and Space Administration – The President's 2009 Budget provides \$17.6 billion for NASA, an increase of 2.9% after accounting for Congress' rescission in the 2008 omnibus of \$192 million in prior-year unobligated NASA funds. A quarter of the agency budget, or \$4.442 billion supports the direct costs of research, technology development and execution of robotic missions in the Science Mission Directorate. The Science program includes investments in space missions that will improve our understanding of Earth's climate; create opportunity for new insights into the Moon and Sun, their history, dynamics and impact on the Earth; explore our solar system; and study our galaxy and the distant universe. The highest priority investments for NASA Science in the 2009 Budget include accelerating the Earth Science missions aligned with the recent Decadal Survey and developing a robust lunar science program.

These physical sciences-related programs total \$13.7 billion in the 2009 Budget, which exceeds the 2008 President's request by \$387 million and the 2008 enacted level by \$1.1 billion.

Department/Agency	Selected Civilian Physical Science-Related Programs (dollars in millions)				
	2001 Actual	2008 Enacted	2009 Budget	Dollar Change: 2001 to 2009	Percent Change: 2001 to 2009
NASA Science*	\$3,806	\$4,627	\$4,442	N/A	N/A
DoE Office of Science	\$3,218	\$3,973	\$4,722	\$1,504	47%
NSF (MPS, GEO, CISE, ENG)	\$2,322	\$2,983	\$3,523	\$1,201	52%
NIST "core" (not including ITS)	\$347	\$605	\$635	\$288	83%
NOAA Oceanic and Atmospheric Research	\$315	\$398	\$378	\$63	20%
TOTAL	\$10,008	\$12,586	\$13,700	\$3,056	49%

* 2009 NASA Science budget reflects accounting changes and transfer of management of the Deep Space Network and Ground Network to another part of the agency. Therefore, the NASA funding levels are not included in the calculation of total \$ change or total % change.



ADVANCED ENERGY INITIATIVE
Research and Development in the President's 2009 Budget

President Bush announced the Advanced Energy Initiative (AEI) in his 2006 State of the Union address to accelerate the technical and cost viability of alternative energy technologies that can change the way we power our vehicles (thereby reducing our dependence on foreign oil) and our homes and businesses (reducing emissions of greenhouse gases and other pollutants). The FY 2009 Budget includes \$3.17 billion for the AEI, a 25% increase over the enacted 2008 level and \$1.4 billion more than the 2006 investment. Examples of technologies that can help change the way we power our homes and businesses include nuclear power (advanced by the Global Nuclear Energy Partnership: GNEP), clean coal (advanced by the FutureGen program), solar, and wind. Examples of technologies that can help reduce our dependence on oil include plug-in hybrid vehicles, hydrogen-powered fuel cells, and biofuels, including "cellulosic" ethanol derived from agricultural waste, forest residues and dedicated energy crops such as switchgrass. An important component of the AEI is critical basic research that should help overcome major technical barriers to the expanded use of technologies such as solar energy, cellulosic ethanol, energy storage, hydrogen fuel cells, and fusion energy (including support for the ITER project).

Program (funding in millions)	2006 Enacted	2008 Enacted	2009 Budget	2009 - 2006(\$)	2009- 2006(%)	2009- 2008(\$)	2009- 2008(%)
Energy Efficiency and Renewable Energy (EERE) R&D Programs							
Hydrogen and Fuel Cell Technology	155	211	146	-9	-6%	-65	-31%
Vehicle Technology	182	213	221	39	21%	8	4%
Biomass	91	198	225	134	147%	27	14%
Solar	83	168	156	73	88%	-12	-7%
Wind	39	50	53	14	36%	3	6%
Geothermal	23	20	30	7	30%	10	51%
Program Management (pro-rata)	58	61	106	48	83%	44	72%
Subtotal, EERE R&D	631	922	936	305	48%	15	2%
Fossil Energy (FE) R&D Programs							
Coal Research Initiative	314	464	588	274	87%	123	27%
FutureGen (non-add)	18	74	156	138	767%	82	110%
Power Generation/Stationary Fuel Cells	62	55	60	-2	-3%	5	8%
Program Management (pro-rata)	86	98	100	14	16%	1	1%
Subtotal, FE R&D	462	618	747	285	62%	129	21%
Nuclear Energy (NE) R&D Programs							
AFCI / GNEP	79	179	302	223	282%	123	69%
Generation IV	54	115	70	16	30%	-45	-39%
Nuclear Power 2010	65	134	242	177	272%	108	81%
Nuclear Hydrogen Initiative	25	10	17	-8	-32%	7	70%
Program Management (pro-rata)	28	59	66	38	136%	7	12%
Subtotal, NE R&D	251	497	697	446	178%	200	40%
Science Basic Research Programs							
ITER Fusion Project	25	11	215	190	760%	204	1,855%
Fusion Energy (not including ITER)	263	276	278	15	6%	2	1%
Solar	28	37	69	41	146%	34	97%
Biomass / Bioenergy	28	113	118	90	321%	5	4%
Hydrogen	58	52	75	17	29%	24	47%
Program Management (pro-rata)	19	22	32	13	68%	11	50%
Subtotal, Science Basic Research	421	508	788	367	87%	279	55%
Total, Advanced Energy Initiative	1,765	2,545	3,168	1,405	80%	624	25%



HOMELAND SECURITY AND NATIONAL DEFENSE *Research and Development in the President's 2009 Budget*

Research and development (R&D) continues to play a key role in securing the Nation against the terrorist threat and enabling its diverse defense missions. The President's 2009 Budget maintains an aggressive investment in scientific research, technology development, and research infrastructure that will continue to enhance our Nation's security and defense capabilities. Priority research areas include:

Department of Defense Science and Technology (DoD S&T): In FY 2009, DoD S&T is \$11.5 billion, approximately 7% above the FY 2008 request, and includes a record \$1.7 billion for basic research (\$270 million or 19% above the 2008 request). Increases in basic research funding will emphasize peer-reviewed research, enhance the science and engineering personnel base, support targeted focus areas, and be responsive to priority S&T capabilities gaps.

Establishing the Nation's Nuclear Defense: The 2009 Budget supports R&D to confront the threat posed to our nation by preventing enemy acquisition of nuclear materials and devices, interdicting those materials and devices, and attributing them to the threat source (nonproliferation). Research and development is also being conducted to manage the consequences of an attack should prevention fail (response and recovery) and quickly and precisely attribute the act of terrorism to those responsible. The National Science and Technology Council (NSTC) Subcommittee on Nuclear Defense R&D, working primarily through the Department of Homeland Security (DHS), DoD, the Department of Energy, and the Director of National Intelligence, is overseeing the interagency process to establish a robust and comprehensive program, with combined R&D funding of \$360 million addressing the threat of radiological or nuclear weapons. DHS' Domestic Nuclear Defense Office 2009 budget is \$564 million, \$79 million, or 16 percent, more than FY 2008 funding.

Countering the Explosives Threat: Conventional explosives in the form of vehicle-borne or improvised explosive devices (IEDs) remain the most accessible weapons available to terrorists for crippling critical infrastructure or inflicting casualties. As called for in Homeland Security Presidential Directive-19, the Attorney General, working with other Departments and Agencies, delivered a strategy this year to the President and his 2009 Budget provides for R&D projects to improve our abilities in this area, including \$96 million for explosives countermeasures research within DHS. In addition, DoD has been funding extensive related research in budget supplementals for the Global War on Terror.

Enhancing Medical Defenses for Chemical, Biological, and Radiological/Nuclear (CBRN) Threats: The FY 2009 budget supports both basic research and advanced development on countermeasures for CBRN attacks. The Department of Health and Human Services (HHS) leads this effort with \$2 billion in R&D funding. This includes targeted investments to address the challenges of bringing advanced medical countermeasures to market and the development of new patient ventilator technologies.

Securing National Information Technology Infrastructure: Under the interagency Networking and Information Technology R&D program, the President is requesting \$280 million in FY 2009 for R&D to prevent, resist, detect, respond to, and/or recover from actions that compromise or threaten the availability, integrity, or confidentiality of the computer- and network-based systems that underpin national defense, homeland security, and the nation's economy.

Protecting the Nation's Food and Livestock: \$691 million is allocated in FY 2009 for the Department of Agriculture (USDA), HHS and DHS to continue efforts to improve food and agriculture defense. This includes funding for an interagency modeling initiative which, under the direction of the NSTC Foreign Animal Disease Threat Subcommittee, will coordinate USDA and DHS foreign animal disease models, fund R&D to enhance the capability of those models, and fund a center through the National Science Foundation to explore new and innovative modeling techniques at the intersection of mathematics and biology. \$46 million is requested for the planning and pre-construction for the National Bio- and Agrodefense Facility which will provide modernized and integrated high-security facilities to conduct research on potential threats to both humans and animals.

Power and Energy Research: Addressing energy demand, storage and usage for DoD requires more than adjustments in policy or logistics; it requires robust R&D to provide for the needs of future weapon systems, infrastructure and power supply. The aggressive DoD strategy includes R&D on alternative fuels, high efficiency turbine aircraft engines, novel battery technology, and a demonstration program for high efficiency vehicles. Over \$500 million is identified in the President's 2009 Budget to support power and energy R&D programs in the DoD.



NATIONAL INSTITUTES OF HEALTH
Research and Development Funding in the President's 2009 Budget

The National Institutes of Health (NIH) has as its mission the discovery of new knowledge that will lead to better health for everyone. NIH accomplishes this goal through a robust program of intramural and extramural research, education and training that is conducted or sponsored by 27 Institutes and Centers which focus on specific diseases, organ systems, or particular life stages (such as childhood or advanced age). Through coordinated activities across the Institutes and Centers as well as public-private partnerships, the promise of translating basic human genome research into new diagnostics and drugs that allow treatments tailored to an individual's genetic make-up – personalized medicine – will soon become possible.

Recognizing the importance of biomedical research to improved health for all Americans, President Bush completed a doubling of the NIH budget in FY 2003. With his 2009 Budget, he would increase discretionary budget authority at NIH by \$8.9 billion, or 44 percent, during this Administration, more than the 31 percent average for all Federal S&T.

The 2009 Budget includes an additional \$38 million, an 8 percent increase, for the NIH Common Fund, bringing the total to \$534 million. The Common Fund is an interdisciplinary incubator for new ideas and initiatives that will accelerate the pace of discovery across the Institutes and Centers. The 2009 Budget also includes increased funding to assist young scientists as they begin their independent research careers. The Pathway to Independence program is funded at a total of \$71 million in order to help reduce the age at which young scientists get their first grant award and to encourage future generations to pursue careers in science.

National Institutes of Health (dollars in millions)	2008 Enacted	2009 Budget
National Cancer Institute	4,805.088	4,809.819
National Heart, Lung, & Blood Institute	2,922.928	2,924.942
National Institute of Dental & Craniofacial Research	389.703	390.535
National Institute of Diabetes & Digestive & Kidney Diseases	1,705.868	1,708.487
National Institute of Neurological Disorders & Stroke	1,543.901	1,545.397
National Institute of Allergy & Infectious Diseases	4,560.655	4,568.778
National Institute of General Medical Sciences	1,935.808	1,937.690
National Institute of Child Health & Human Development	1,254.708	1,255.920
National Eye Institute	667.116	667.764
National Institute of Environmental Health Sciences	642.253	642.875
National Institute on Aging	1,047.260	1,048.278
National Institute of Arthritis and Musculoskeletal & Skin Diseases	508.586	509.080
National Institute on Deafness & other Communication Disorders	394.138	395.047
National Institute of Mental Health	1,405.476	1,406.841
National Institute on Drug Abuse	1,000.700	1,001.672
National Institute on Alcohol Abuse and Alcoholism	436.259	436.681
National Institute of Nursing Research	137.476	137.609
National Human Genome Research Institute	486.779	487.878
National Institute of Biomedical Imaging and Bioengineering	298.645	300.254
National Center for Research Resources	1,149.446	1,160.473
National Center for Complementary and Alternative Medicine	121.577	121.695
National Center on Minority Health and Health Disparities	199.569	199.762
Fogarty International Center	66.558	66.623
National Library of Medicine	320.962	323.046
Office of the Director	1,109.099	1,056.797
Buildings and Facilities	118.966	125.581
L/HHS Appropriation Total	2,9229.524	29,229.524
Interior (NIEHS)	77.546	77.546
Total, Budget Authority	29,307.070	29,307.070
Mandatory Diabetes	150.000	150.000
National Library of Medicine Evaluation	8.200	8.200
Total, Program Level	29,465.270	29,465.270



SPACE SCIENCE, AERONAUTICS AND EXPLORATION

NASA Research and Development Funding in the President's 2009 Budget

The President's 2009 Budget for NASA is \$17.6 billion, a \$496 million increase over the FY 2008 enacted, reflecting a strong continuing commitment by the Administration to the quest for new knowledge, discovery and exploration. The 2008 omnibus also included about \$90 million in earmarks. The 2009 NASA request supports robust programs in science and aeronautics while also advancing NASA's progress towards the Vision for Space Exploration.

First, an exciting array of science missions is being pursued that will enhance our understanding of the solar system, the Earth's environment and its complex interactions with the Sun, and the origin, structure, evolution and destiny of the universe. Next, NASA has restructured its aeronautics program to focus on long-term research of broad benefit to the Nation, consistent with the new National Aeronautics R&D Policy and its associated R&D Plan. And in the four years since the President outlined a new Vision for the human and robotic exploration of space, NASA has successfully resumed the assembly of the International Space Station (ISS) and made significant progress toward developing the launch and spacecraft architecture necessary to implement that Vision. At the same time, NASA has begun to develop goals and plans for future activities on the lunar surface, supported by an ongoing dialogue with other countries on potential exploration strategies and areas for international cooperation.

- **Advancing Earth and Space Science** - The 2009 NASA budget includes \$4.44 billion, almost a third of NASA's total budget after accounting for overhead costs and other recent program composition adjustments, to continue operating the nearly 60 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 launch seven new Earth observing missions in the next several years, including projects such as the Landsat Data Continuity Mission and the Global Precipitation Measurement mission. In a significant new initiative, NASA also will embark upon a series of high-priority, space-based Earth observing missions, informed by the recommendations of the National Research Council's recent Decadal Survey on earth sciences. At the same time, 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 expand its program of scientific exploration of the Moon through a new series of low-cost robotic missions that will advance our knowledge of Earth's closest neighbor as we prepare for a human return to the Moon. Following up ongoing missions to Mars, Saturn and Mercury, NASA also will send ever-more-capable spacecraft to Mars and other outer planets. In addition, NASA will continue its vibrant astrophysics and astronomy efforts through programs such as Beyond Einstein and the Great Observatories, and will upgrade the Hubble Space Telescope in late 2008 to provide five more years of productive on-orbit life. NASA also will maintain its important heliophysics research through projects such as the Radiation Belt Storm Probes.
- **New National Aeronautics R&D Plan** - In December 2007, the President approved the nation's first National Plan for Aeronautics R&D and Related Infrastructure. Consistent with this Plan, the 2009 NASA aeronautics budget prioritizes fundamental aeronautics research, the improvement of aviation safety, and research supporting the development of the Next Generation Air Transportation System. In addition, NASA will continue to address infrastructure upgrades and maintenance requirements for aeronautical test facilities across NASA centers that are of vital importance to the Nation. The 2009 budget requests \$447 million for NASA aeronautics direct costs.
- **Progress on the Exploration Vision** - NASA requests \$3.5 billion in 2009 for new vehicles and technologies to enable sustained and affordable human and advanced robotic exploration. NASA has identified the major design features and requirements for two key architecture elements -- the Orion Crew Exploration Vehicle and the Ares I launch vehicle that will carry astronauts to the Moon -- and now has placed all of the major system components for these two vehicles under contract. In addition, NASA plans to launch the Lunar Reconnaissance Orbiter in late 2008 to acquire information to support future human missions and to conduct scientific study of the Moon. NASA also will continue pursuing critical new technologies to support exploration activities.
- **Assembling and Utilizing the International Space Station** - The 2009 NASA budget proposes \$3 billion for operating the Space Shuttle and \$2.1 for continuing assembly and operations of the Space Station. NASA is assembling the Space Station consistent with the President's exploration vision and the needs of our international partners, while employing the minimum number of Shuttle flights required to complete assembly before Shuttle retirement in 2010. NASA successfully conducted three Space Shuttle flights in 2007, all in support of Space Station assembly. NASA continues to focus U.S. research activities on the Space Station to understand and counter the negative effects of the long duration exposure of humans to the space environment. NASA is working with private industry to develop the capability to support the Space Station in the post-Shuttle era. The 2009 Budget contains \$173 million to encourage the development for commercial services to the Space Station, and \$2.6 billion over five years to procure those services.



CLIMATE CHANGE SCIENCE AND TECHNOLOGY

Research and Development Funding in the President's 2009 Budget

Federal climate change expenditures, last estimated at a record \$7.4 billion in the 2008 Budget, reflects the Administration's commitment to meeting the aims of the United Nations Framework Convention on Climate Change while preserving a strong American economy. The President's 2009 Budget supports a wide range of climate change-related activities in four main categories – science, technology, international assistance, and tax provisions. Climate change science and technology are described below:

Climate Change Science Program

The U.S. Global Change Research Program, authorized by the Global Change Research Act of 1990, and the President's Climate Change Research Initiative of 2001 are integrated in the comprehensive U.S. Climate Change Science Program (CCSP). The CCSP Strategic Plan prioritizes developing knowledge on climate variability and change and for application of this knowledge.

Working within the overarching priorities defined in the Strategic Plan, the CCSP's interagency coordination and integration efforts will give particular emphasis in FY 2009 to the following climate change research issues:

- development of an integrated earth system analysis capability;
- creating a high-quality record of the state of the atmosphere and ocean since 1979;
- development of an end-to-end hydrologic projection and application capability;
- enhanced carbon cycle research on high latitude systems;
- quantification of climate forcing and feedbacks by aerosols,
- non-carbon dioxide greenhouse gases, water vapor, and clouds;
- assessment of abrupt change in a warming climate;
- examination of the feasibility of development an abrupt change early warning system;
- ecological forecasting.

The completion in 2007 of the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) relied heavily on U.S. funded science, much of which falls under the Climate Change Science Program. The work and four reports of the IPCC AR4 resulted in a shared Nobel Peace Prize for the IPCC, and the U.S. climate science enterprise contributed substantial and critical pieces of the foundational research in this widely referenced body of work.

CCSP has charted a set of 21 synthesis and assessment products (SAP) to provide technical summaries for policy makers. The first SAP was released in 2006. Three SAPs were completed in 2007. Twelve SAPs are scheduled to be published in 2008, with the final 5 due in 2009.

The FY 2009 CCSP budget request is \$2.02 billion, an increase of 10%, \$177 million, over 2008. The CCSP comprises over 13 agencies, but over 90% of the CCSP funding is distributed among the National Aeronautics and Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), the National Science Foundation (NSF) and the Department of Energy (DoE). In fact, the 2009 CCSP budget seeks to expand research from the just enacted 2008 levels for NASA (11.7 percent); NOAA (8.3%); NSF (7.8 percent); and DOE (14.1 percent).

Climate Change Technology Program

The U.S. Climate Change Technology Program (CCTP) is a multi-agency effort coordinated by DoE that incorporates a variety of R&D activities to foster technologies that result in reduced greenhouse gas emissions. The CCTP provides strategic direction, planning, and analysis to help coordinate and prioritize the R&D activities within the portfolio in areas such as nuclear energy, carbon sequestration, renewable energy, energy efficiency, and low-carbon fuels. The CCTP has published a Strategic Plan that describes its vision and goals, as well as the potential contributions of new technologies to address climate change under various global scenarios. The CCTP has also identified within its portfolio a subset of priority R&D activities. In 2009, the CCTP will continue to focus on implementing the elements of its Vision and Framework document and Strategic Plan. Reports and general information about the CCTP are available on the program's website: www.climatetechnology.gov/.



EARTH OBSERVATIONS

Research and Development Funding in the President's FY 2009 Budget

The U.S. supports space-based, airborne and ground-based instruments to observe, monitor and measure a multitude of the Earth's characteristics around the globe. The President is committed to optimizing these scientific efforts by developing sustained and integrated Earth Observation systems for the Nation and by making these systems an integral part of a global system. The 2009 Budget includes:

- Funds to sustain the highest priority climate measurement capabilities that once were part of the tri-agency National Polar-Orbiting Operational Environmental Satellite System (NPOESS) program (but were removed or "de-manifested" during the 2006 restructuring of NPOESS in response to significant NPOESS cost over-runs). This operational climate sensor package will be supported with \$74 million in FY 2009 funds requested by the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA).
- \$103 million in FY2009 (with a total of \$910 million over five years) for the National Aeronautics and Space Administration (NASA) to embark on a series of space-based Earth observing missions that the National Research Council's recent "decadal survey" ranked as the top priorities for Earth sciences, including: 1) SMAP (Soil Moisture Active/Passive), which will enable global soil moisture mapping with unprecedented resolution, sensitivity, area coverage, and revisit times; and, 2) ICESat (Ice, Cloud, and land Elevation Satellite), the benchmark Earth Observing System mission for measuring ice sheet mass balance, cloud and aerosol heights, and land topography and vegetation characteristics. NASA will also continue ongoing work to develop and launch seven new Earth observing missions in the next several years while operating fourteen missions presently on orbit.
- \$139 million for NASA to procure the LandSat Data Continuity Mission to continue the 35-year record of land imagery from space critical to Earth Observations data continuity.
- \$2 million for the U.S. Geological Survey (USGS) to establish a National Land Imaging Program office to ensure long-term continuity of multi-spectral imaging of the Earth's surface, consistent with the recommendation of the Interagency Working Group on the Future of Land Imaging.
- \$126 million for NASA to launch the Global Precipitation Measurement (GPM) mission core spacecraft no later than 2013.
- \$21 million to support the NOAA-led Integrated Ocean Observing System and a total of \$10.5 million for the National Science Foundation's (NSF) Ocean Observatories Initiative.
- Improvement of U.S. earthquake monitoring and prediction capabilities by NSF and USGS through EarthScope at \$26.3 million and the Advanced National Seismic System at \$8 million.



Math and Science Education

ACI in NCLB: The 2007 Nation's Report Card shows that the No Child Left Behind Act (NCLB) is helping raise achievement for all kinds of children, in all kinds of schools, in every part of the country. For example, last year, fourth and eighth graders achieved the highest math scores on record. President Bush believes we must build on this progress by reauthorizing and strengthening this law. As part of the President's NCLB reauthorization proposal, the President's 2009 Budget asks Congress to provide \$175 million in funding for the American Competitiveness Initiative (ACI) programs within the Department of Education (ED). Although two of these programs, Math Now and Advanced Placement (AP), were recently authorized under the America COMPETES Act, the Administration continues to seek program improvements through authorization language as part of NCLB reauthorization. The President's FY 2009 request includes:

- \$95 million for the Math Now program to implement research based practices in math instruction for students in kindergarten through 9th grade.
- \$70 million for the Advanced Placement program to target Federal support specifically to prepare more teachers to teach AP courses and to encourage more students from high-need schools to take and pass AP courses and tests. As authorized, the program can support awards to teachers who become qualified to teach AP courses or whose students pass the AP and IB tests.
- \$10 million for an Adjunct Teacher Corps initiative to create opportunities for qualified professionals from outside the K-12 educational system to teach secondary-school courses in the core academic subjects, with an emphasis on mathematics and the sciences.

Other elements of the ACI: The ACI is a multi-agency collaboration, first included in the 2007 Budget, aimed at ensuring America's competitive edge through targeted investments in scientific research and math and science education. Other education-related elements of the ACI include:

- The National Mathematics Advisory Panel (NMP) - Established by President Bush under Executive Order on April 16, 2006, the NMP was created to advise the President and the Department of Education on the conduct, evaluation, and effective use of the results of high quality research pertaining to the effective teaching and learning of mathematics. The NMP has met eleven times, reviewed over 16,000 studies and other scientific documents, and received public comment and testimony from over 60 individuals and organizations. Its recommendations will be issued in a final report on February 28, 2008. Findings will inform numerous educational efforts including the development of the Math Now program. The NMP is coordinated through the Department of Education; comprised of multidisciplinary experts; and includes ex-officio membership from the National Institutes of Health, the National Science Foundation, and the White House Office of Science and Technology Policy.
- Interagency coordination - The Academic Competitiveness Council (ACC), created by the Deficit Reduction Act of 2005 and chaired by the Secretary of Education, identified over 100 programs in 12 Federal agencies which received over \$3.1 billion in total 2006 funding. Through collaborative interagency efforts undertaken by the ACC and the President's National Science and Technology Council, the Administration is working to improve the effectiveness of existing investments to ensure that they produce measurable results in math and science education.

Math and Science Partnerships: The FY 2009 Budget provides sustained funding for the Math and Science Partnerships (MSP) programs at both the Department of Education (\$179 million) and the National Science Foundation (\$51 million). Although both MSP programs facilitate partnerships between local school districts and institutions of higher education aimed at improving math and science education, the Education Department component is a formula program that provides money to states (who in turn sponsor funding competitions), whereas the NSF component is a nationally competitive program. Although the two programs share the same name and similar goals, there is an appropriate role for each agency in developing, assessing and disseminating effective instructional materials and methods to students across the country. The Administration will ensure that evaluation principles developed by the ACC are reflected in both programs and that these complementary programs coordinate their activities, as appropriate, to meet their shared goals.

R&D in ED: Research, Development, and Dissemination at the Department of Education, part of the Federal Science and Technology Budget, is increased four percent to \$167 million in FY 2009.