

NATIONAL NANOTECHNOLOGY INITIATIVE FY 2009 BUDGET & HIGHLIGHTS



The 2009 Budget provides \$1.5 billion for the National Nanotechnology Initiative (NNI), reflecting steady growth in the NNI investment. This sustained major investment in nanotechnology research and development (R&D) across the Federal Government over the past nine fiscal years of the NNI reflects the broad support of the Administration and of Congress for this program, based on its potential to vastly improve our fundamental understanding and control of matter, ultimately leading to a revolution in technology and industry for the benefit of society. The NNI remains focused on fulfilling the Federal role of supporting basic research, infrastructure development, and technology transfer, in the expectation that the resulting advances and capabilities will make important contributions to national priorities, with applications across a wide range of industries including healthcare, electronics, aeronautics, and energy. Increasing investments by mission agencies in nanotechnology-related research since 2001 reflect a recognition of the potential for this research to support agency missions and responsibilities.

Table 1 provides NNI investments in 2007–2009 for Federal agencies with budgets/investments for nanotechnology R&D. Tables 2-4 list the investments by agency and by program component area (PCA). Note that the program component areas shown in these tables are those outlined in the new NNI Strategic Plan released in December 2007,¹ with nanotechnology-related environmental, health, and safety (EHS) research now reported for the first time in a separate PCA from education and other societal dimensions investments.

The 2009 NNI budget supports nanoscale science and engineering R&D at 13 agencies. Agencies with the greatest investments are the Department of Defense (DOD—investments addressing the defense mission); the National Science Foundation (NSF—fundamental research across all disciplines of science and engineering); the Department of Energy (DOE—research providing a basis for new and improved energy technologies); the National Institutes of Health (NIH, within the Department of Health and Human Services, DHHS—nanotechnology-based biomedical research at the intersection of biology and the physical sciences); and the National Institute of Standards and Technology (NIST—fundamental research and development of tools, analytical methodologies, and metrology for nanotechnology). Other agencies that are investing in mission-related research are the National Aeronautics and Space Administration (NASA), the National Institute for Occupational Safety and Health (NIOSH/DHHS), the Environmental Protection Agency (EPA), and the Departments of Agriculture (USDA—Cooperative State Research, Education, and Extension Service, CSREES; and Forest Service, FS), Homeland Security (DHS), Justice (DOJ), and Transportation (DOT—Federal Highway Administration, FHWA).

Key Points about the 2009 NNI Investments

- The 2009 NNI budget provides increased support for research on fundamental nanoscale phenomena and processes, from \$481 million in 2007 to \$551 million in 2009.
- Increases in nanotechnology R&D funding for DOE, NIST, and NSF reflect the President's continuing commitment to significantly increase funding for physical sciences and engineering research as part of the American Competitiveness Initiative.
- The proposed budget also reflects substantial ongoing growth in funding for instrumentation research, metrology, and standards (from \$53 million in 2007 to \$82 million in 2009) and in nanomanufacturing research (from \$48 million in 2007 to \$62 million in 2009). NNI agencies are gathering input and feedback from industry and the research community on these growing investments through a series of workshops.
- EHS R&D funding in 2009 (\$76 million) is over double the level of actual funding in 2005 (\$35 million)—the first year this data was collected. The steady growth in EHS R&D spending follows the NNI strategy of expanding the capacity to do high-quality research in this field. For tables in this document, EHS R&D is defined as research whose primary purpose is to understand and address potential risks to health and to the environment posed by nanotechnology. Therefore the proposed \$76 million for 2009 does not include substantial research reported under

¹ http://www.nano.gov/NNI_Strategic_Plan_2007.pdf

other PCAs, e.g., on instrumentation and metrology and on fundamental interactions between biosystems and engineered nanoscale materials, both of which are important in the performance and interpretation of toxicological research. An indication of the level of funding for these broader categories of nanotechnology-related EHS research may be deduced from the detailed 2006 data collected and analyzed specifically for this purpose. This data showed that the total funding for nanotechnology-related EHS research in 2006 was about \$68 million, 80% higher than that reported for “primary purpose research.”

- A more detailed Budget Supplement will be released when data become available on funding for nanotechnology under the Small Business Innovation Research (SBIR) and Small Business Technology Transfer Research (STTR) programs.

	2007 Actual	2008 Estimate*	2009 Proposed
DOD	450	487	431
NSF	389	389	397
DOE**	236	251	311
DHHS (NIH)	215	226	226
DOC (NIST)	88	89	110
NASA	20	18	19
EPA	8	10	15
DHHS (NIOSH)	7	6	6
USDA (FS)	3	5	5
USDA (CSREES)	4	6	3
DOJ	2	2	2
DHS	2	1	1
DOT (FHWA)	1	1	1
TOTAL	1,425	1,491	1,527

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

** Funding levels for DOE include the Offices of Science, Fossil Energy, and Energy Efficiency and Renewable Energy.

	Fundamental Phenomena & Processes	Nanomaterials	Nanoscale Devices & Systems	Instrument Research, & Metrology, & Standards	Nano-manufacturing	Major Research Facilities & Instr. Acquisition	Environment, Health, and Safety	Education & Societal Dimensions	NNI Total
DOD	210.1	86.0	120.0	4.3	7.5	22.3			450.2
NSF	145.2	58.4	52.4	14.9	26.6	30.0	26.9	34.4	388.8
DOE	52.6	68.5	9.7	11.3	0.5	92.9		0.5	236.0
DHHS (NIH)	45.7	25.4	125.7	5.9	0.8		7.7	4.2	215.4
DOC (NIST)	24.2	7.5	22.9	14.2	12.4	5.5	0.9		87.6
NASA	0.8	9.9	9.1						19.8
EPA	0.2	0.2	0.1				7.1		7.6
DHHS (NIOSH)						1.7	5.6		7.3
USDA (FS)	0.4	1.3	0.7	0.3	0.2				2.9
USDA (CSREES)	0.5	1.0	2.1		0.1		0.1	0.1	3.9
DOJ		0.1		1.6					1.7
DHS			2.0						2.0
DOT (FHWA)	0.9								0.9
TOTAL	480.6	258.3	344.7	52.5	48.1	152.4	48.3	39.2	1,424.1

Table 3
Estimated 2008 Agency Investments by Program Component Area
(dollars in millions)

	Fundamental Phenomena & Processes	Nanomaterials	Nanoscale Devices & Systems	Instrument Research, & Metrology, & Standards	Nano-manufacturing	Major Research Facilities & Instr. Acquisition	Environment, Health, and Safety	Education & Societal Dimensions	NNI Total
DOD	258.7	68.9	119.8	8.0	5.4	24.6	2.0		487.4
NSF	138.8	62.1	50.3	16.0	26.9	31.6	29.2	33.8	388.7
DOE	51.4	77.5	13.0	12.0	2.0	92.0	3.0	0.5	251.4
DHHS (NIH)	55.6	25.4	125.8	5.9	0.8		7.7	4.6	225.8
DOC (NIST)	22.5	7.4	21.7	16.1	14.4	5.8	0.8		88.7
NASA	1.5	9.7	6.2			0.4	0.2		18.0
EPA	0.2	0.2	0.2				9.6		10.2
DHHS (NIOSH)							6.0		6.0
USDA (FS)	1.3	1.9	1.2	0.4	0.2				5.0
USDA (CSREES)	0.7	1.6	3.1		0.5		0.1	0.1	6.1
DOJ				2.0					2.0
DHS			1.0						1.0
DOT (FHWA)	0.9								0.9
TOTAL	531.6	254.7	342.3	60.4	50.2	154.4	58.6	39.0	1,491.2

Table 4
Planned 2009 Agency Investments by Program Component Area
(dollars in millions)

	Fundamental Phenomena & Processes	Nanomaterials	Nanoscale Devices & Systems	Instrument Research, & Metrology, & Standards	Nano-manufacturing	Major Research Facilities & Instr. Acquisition	Environment, Health, and Safety	Education & Societal Dimensions	NNI Total
DOD	227.8	55.2	107.7	3.6	12.8	22.1	1.8		431.0
NSF	141.7	62.5	51.6	16.0	26.9	32.1	30.6	35.5	396.9
DOE	96.9	63.5	8.1	32.0	6.0	101.2	3.0	0.5	311.2
DHHS (NIH)	55.5	25.4	125.8	5.9	0.8		7.7	4.6	225.7
DOC (NIST)	24.5	8.5	22.7	20.9	15.3	5.7	12.8		110.4
NASA	1.2	9.8	7.7			0.2	0.1		19.0
EPA	0.2	0.2	0.2				14.3		14.9
DHHS (NIOSH)							6.0		6.0
USDA (FS)	1.7	1.3	0.7	1.1	0.2				5.0
USDA (CSREES)	0.4	0.8	1.5		0.1		0.1	0.1	3.0
DOJ				2.0					2.0
DHS			1.0						1.0
DOT (FHWA)	0.9								0.9
TOTAL	550.8	227.2	327.0	81.5	62.1	161.3	76.4	40.7	1,527.0

Highlights of Ongoing and Planned Activities

- The extensive network of research centers, user facilities and other infrastructure for nanotechnology research, originally envisioned as a key element of the NNI strategy, is now largely complete. This mature infrastructure serves

to accelerate nanotechnology research and development and enables researchers from across various sectors to broadly leverage their interdisciplinary intellectual and technological capital. NNI agencies are encouraging industrial interaction with NNI-funded research centers, and are promoting broad access to the NNI user facilities by all sectors, including small businesses. While emphasis in the near future will be on maximizing the utility and utilization of the substantial infrastructure already in place, the agencies will also consider possible new needs for the longer term.

- Industry liaison and technology transfer activities are given a high priority in the new NNI Strategic Plan released in December 2007. NNI agencies are working with industry representatives to gather input on their nanotechnology-related activities and are funding increasing numbers of nanotechnology-related SBIR and STTR awards to promote technology transfer to industry. Industry liaison groups with the electronics, forest products, and chemical industries, and with the industrial research management community, are continuing, while formation of comparable groups with other sectors (e.g., the construction industry) is under consideration. One successful example is the collaboration between NSF, NIST, and the industry-led Nanoelectronics Research Initiative, where industry and government representatives collaborate in reviewing proposals and in supporting pre-competitive research. In another example, NIH is formulating a “NanoHealth Enterprise,” which is envisioned as a partnership with other Federal agencies, private industry, and international partners to address research needs for safe development of nanoscale materials and devices.
- EHS research planning is a major activity for the NNI. In August 2007, the National Science and Technology Council’s Nanoscale Science, Engineering, and Technology (NSET) Subcommittee published a draft report for public comment prepared by its Nanotechnology Environmental and Health Implications (NEHI) Working Group entitled *Prioritization of Environmental, Health, and Safety Research Needs for Engineered Nanoscale Materials*, and, in February 2008, completed a comprehensive *Strategy for Nanotechnology-Related Environmental, Health, and Safety Research*. This is the culmination of two years of intensive work, including a detailed review of individual EHS research projects funded by the NNI agencies in 2006, as a guide to identification of gaps in the research portfolio compared to the designated priority research areas.
- As the NNI EHS research strategy evolves, ongoing activities to address the breadth of EHS issues proceed at an accelerating pace. A Food and Drug Administration (FDA) task force released a report in 2007 addressing scientific questions related to the application of its regulatory authorities to nanotechnology-enabled products. EPA issued a white paper on nanotechnology in 2007, and has initiated a Nanoscale Materials Stewardship Program under the Toxic Substances Control Act (TSCA) to gather and develop information from manufacturers, importers, processors and users of engineered chemical nanoscale materials. NIOSH continues to update its guidance document on best practices for safe handling of nanomaterials in the workplace, and has posted a draft document providing interim guidance on medical screening of workers potentially exposed to engineered nanoparticles. NNI agencies organized a workshop hosted by NIST in September 2007 entitled “Standards for Environmental, Health, and Safety for Engineered Nanoscale Materials.” On the research front, two joint interagency solicitations addressing potential environmental and health implications of nanotechnology continue. One (led by EPA, with NSF) addresses environmental implications, while another (led by NIH, with EPA and NIOSH) focuses on human health implications. NSF and EPA will fund a new Center for Environmental Implications of Nanotechnology (CEIN) in 2008. NSF plans to form a network around it in 2009 with collaboration from EPA and other agencies.
- International collaborations in nanotechnology are progressing, with strong NNI participation. The Organisation for Economic Cooperation and Development (OECD) Working Party on Manufactured Nanomaterials, chaired by the United States, has begun its work addressing health and safety issues. A second OECD working party formed under the Committee for Scientific and Technological Policy is addressing broader issues such as economic impact, education and training, and public communication. With respect to standards development, the National Nanotechnology Coordination Office and several NSET member agencies represent the United States on the International Organization for Standardization (ISO) Technical Committee on Nanotechnologies (ISO TC 229), and the United States leads the ISO TC 229 working group on EHS aspects of nanotechnology.

