



Executive Office of the President
Office of Management and Budget




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Office of Science and Technology Policy

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MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

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SUBJECT: FY 2009 Administration Research and Development Budget Priorities

We have updated the Administration's research and development (R&D) priorities, which reflect input from both the President's Council of Advisors on Science and Technology (PCAST) and the National Science and Technology Council (NSTC). We also emphasize improving management and performance to maintain excellence and leadership in science and technology.

The sections that follow:

- highlight the President's American Competitiveness Initiative;
- provide general guidance for setting priorities for agency R&D programs;
- identify interagency R&D efforts that should receive special focus in agency budget requests;
- reiterate the R&D Investment Criteria that agencies should use to improve investment, and for decisions about and management of their R&D programs.

Presidential Priority: American Competitiveness Initiative

The President is committed to the success of the American Competitiveness Initiative (ACI) announced in his 2006 State of the Union address. The ACI doubles investment over 10 years in key Federal agencies supporting basic research in the physical sciences and engineering. This innovation-enabling research includes high-leverage areas that develop and advance knowledge and technologies used by scientists in nearly every other field. President Bush has successfully begun the doubling path for the National Science Foundation, the Department of Energy's Office of Science, and the Department of Commerce's National Institute of Standards and Technology core activities with an aggregate 17 percent increase in the first two years of the Initiative. To continue the doubling, these agencies should propose increases in FY 2009 that meet scheduled, ongoing facilities needs and provide for unique, high-value research opportunities. These proposals should be consistent with published out-year budget plans. We will evaluate the three requests together to determine final individual agency allocations. In addition to the doubling effort at these three agencies, real increases (above inflation) in the high-leverage basic research of the Department of Defense should be a significant priority.

General R&D Program Guidance

Agencies are expected to conduct programs in accordance with the highest standards of ethical and scientific integrity and to have clear principles, guidelines and/or policies on issues such as scientific openness, scientific misconduct, conflict of interest, protection of privacy, and the appropriate treatment of human subjects.

Careful attention to funding priorities and wise choices are required due to the combination of finite resources, the commitment to the American Competitiveness Initiative, and a multitude of new research opportunities. Agencies must evaluate existing programs and, wherever possible, consider them for modification, redirection, reduction or termination, in keeping with national needs and priorities. New programs have to be justified with rigorous analysis demonstrating their merit, quality, importance and consistency with national priorities. Agencies may propose new, high-priority activities, but these requests should identify potential offsets by elimination or reductions in less effective or lower priority programs, or programs where Federal involvement is no longer needed or appropriate.

In general, the Administration favors Federal agency R&D investments that:

- advance fundamental scientific discovery to improve future quality of life;
- support high-leverage basic research to spur technological innovation, economic competitiveness and new job growth;
- strengthen science, mathematics and engineering education based on the recommendations of the Academic Competitiveness Council and the National Math Panel to ensure a scientifically literate population and a supply of qualified technical personnel commensurate with national need;
- enable potentially high-payoff activities that require a Federal presence to attain long-term national goals, especially national security, energy independence, and a next-generation air transportation system;
- sustain specifically authorized agency missions (e.g., scientific discovery in NASA) and user facilities that support the authorized missions of other agencies;
- enhance the health of our Nation's people to reduce the burden of illness and increase productivity while respecting the inherent dignity and value of every human life;
- improve our ability to understand and respond to climate change and other global environmental issues and natural disasters through better observation, data, analysis, models, and basic and social science research;
- maximize the efficiency and effectiveness of the science and technology (S&T) enterprise through expansion of competitive, merit-based peer-review processes;
- phase out programs that are only marginally productive or are not important to an agency's mission; and
- encourage interdisciplinary research efforts on complex scientific frontiers and strengthen international partnerships to accelerate the progress of science across borders.

Interagency R&D Priorities

While some priority R&D areas fall mainly within the purview of a single agency, such as the President's space exploration vision at the National Aeronautics and Space Administration and Advanced Energy Initiative at the Department of Energy, other areas require strong interagency coordination. The following interagency R&D priorities should receive special focus in agency budget requests as relevant and appropriate to an agency's mission. If an agency receives funding for these activities, it should maximize planning and coordination through participation in applicable interagency coordination groups, especially the NSTC, to produce:

- 1) a clear and concise definition of program activities and priorities within the overall priority area;
- 2) an inventory of the programs in the baseline budget;
- 3) agency trade-offs that will provide the resources to help produce a coordinated, cross-agency program with greater impact than that of the individual activities; and
- 4) an interagency implementation plan.

Homeland Security and National Defense

The Nation's science and technology enterprise is a key asset to protecting the homeland and enabling national defense. Emphasis should be placed on agency research efforts in the following two areas:

Defense against the threat of a domestic nuclear event. Development of transformational capabilities for the stand-off detection of nuclear materials must proceed as rapidly as possible. Emphasis is needed on R&D to better understand and mitigate the social and economic effects of a domestic nuclear explosion, including better tools to treat the injured and means for rapidly assessing damage to critical infrastructure and developing recovery options.

Biometrics. Rapid, reliable and accurate biometric-based recognition of individuals is necessary for successful homeland security, counterterrorism, border control, law enforcement, e-commerce and e-government, and identity theft prevention. As directed by the National Security Council's Deputies Committee, agencies are to place emphasis on the priorities outlined in *The National Biometrics Challenge* and the resulting agenda developed by the NSTC Subcommittee on Biometrics and Identity Management. This will advance systems, methods and tools to achieve real-time, verifiable, interoperable, and privacy-protecting root identification. Each agency's plans to fulfill their portion of the agenda, and planned coordination with other agencies, should be highlighted in their budget requests.

Continue R&D efforts that support the development of:

- capabilities to counter the domestic threat from improvised explosive devices as emphasized in Homeland Security Presidential Directive 19;
- common decision support tools for response and coordination that integrate information from across domains and are applicable to various hazard scenarios including natural disasters, terrorist attack or disease outbreak;
- sampling and decontamination methodologies and tools for remediation of chemical, biological, radiological, and nuclear incidents including development of scientifically derived protective action guidelines;

- integrated predictive modeling capabilities for potential hazards and the basic science and data collection required to support these predictive capabilities;
- standardized, rapid, reliable and cost-effective detection systems and broad spectrum treatments to counter the threat of engineered biological weapons and emerging infectious diseases; and
- new methods to address the natural or intentional introduction of agricultural threats and the associated threats to human health, including new methods for detection, prevention, and characterization of high-consequence agents in the food and water supply.

Energy and Climate Change Technology

Within the context of the R&D investment criteria, energy R&D should support progress in two interconnected areas: energy security and greenhouse gas emission reduction. Priority should be put on eliminating scientific and technical barriers that limit the advancement of renewable, zero emission, and alternative energy sources. Agencies should align their R&D portfolios to achieve the goals put forth by the President, specifically: 1) to reduce U.S. gasoline consumption by 20 percent over the next ten years, compared to projections; and 2) to continue to advance the development of advanced energy technologies that cost-effectively reduce greenhouse gas emissions, especially basic research targeting scientific and technical breakthroughs in such areas as zero carbon emissions coal and carbon sequestration processes, nuclear energy, energy storage, solar energy, and hydrogen fuel cell technologies. Agencies should coordinate their R&D efforts through the Climate Change Technology Program (CCTP) to cost-effectively maximize greenhouse gas reductions across the overall portfolio of energy technologies to avoid duplication and should work with CCTP to quantifiably estimate the greenhouse gas benefits of their efforts. Trade-offs should be made as necessary to ensure success in areas identified to have the most promise and should enhance the integration of basic and applied research efforts.

To accelerate development of more efficient biofuels conversion technologies, agencies should:

- focus on fundamental research needs including optimized crops and cellulosic materials, material collection and pretreatment methods, and biorefinery processes, and
- investigate technologies and methods to mitigate potential environmental impacts associated with the increased supply, distribution, acquisition and use of biofuels.

Advanced Networking and Information Technology

The PCAST will be completing its comprehensive review of the interagency Networking and Information Technology R&D (NITRD) program by summer 2007. Agencies should consider the recommendations in the PCAST report when prioritizing investments in NITRD topics.

Investments in advanced networking R&D should focus on research in the foundations, design, management, security, and usability of future computing and communications networks to help sustain the Nation's military, scientific, economic, and technological preeminence. Specifically, agencies should continue their current active coordination and prioritization to complete the *Federal Plan for Advanced Networking R&D* to inform and guide their budget requests in this priority area.

Agencies should also prioritize implementation of the Federal Plan for Cyber Security and Information Assurance (CSIA) R&D. CSIA R&D should address any mission-relevant gaps identified in the Federal Plan; and should emphasize coordination, leveraging the efforts of all agencies and, where appropriate, use of coordinated multi-agency investments.

Agencies should continue to advance and coordinate investments in high-end computing. High-end computing should be increasingly used to support research for transformational solutions to complex problems in energy, climate and weather, human health, new materials and national security.

Agencies supporting R&D in these and other on-going components of the NITRD program are expected to participate in interagency planning through the NSTC to help prioritize future investments.

National Nanotechnology Initiative (NNI)

Robust Federal investment in the agency programs that make up the NNI will expedite realization of the potential of nanotechnology to address national priorities in areas such as energy, security, healthcare, and the environment and maintains U.S. scientific and technological leadership in this field.

Agencies should strengthen interagency coordination of and support research on potential risks to human health and the environment, consistent with the NSTC's 2006 report, *EHS Research Needs for Engineered Nanoscale Materials*.

More broadly, the NNI should support both basic and applied R&D in nanoscience, develop instrumentation and methods for nanoscale characterization and metrology, and disseminate new technical capabilities to help industry advance nanofabrication and nanomanufacturing.

Nanoscale research offers a natural bridge to collaboration between the life and physical sciences; therefore, agencies are encouraged to use approaches that accelerate interdisciplinary and interagency collaboration. Agencies are encouraged to participate in activities such as joint programs utilizing shared resources or leveraging complementary assets, as well as support for interdisciplinary activities at centers and user facilities.

Understanding Complex Biological Systems

Agencies should target research on a deeper understanding of complex biological systems through multi-disciplinary collaborations aimed at developing new and improved measurement and management tools to provide valid data that can be compared across laboratories and platforms.

Access to new biotechnological tools and increasing amounts of genetic sequence data opens new avenues for research into the functional implications of gene expression. Agencies should continue to pursue the development of new diagnostic and therapeutic applications targeted toward specific diseases and conditions, including ultimately those that are personalized based on the needs and genetic make-up of individuals.

At the same time, rapidly developing methods and capabilities within the behavioral and social sciences are enhancing our knowledge of organisms and larger systems and providing greater insight into the relationship between biological, physiological and cultural influences on human behavior and decision-making.

Agencies should focus research at the:

- cellular/sub-cellular and the organism/population/community levels; and
- interface of the life, physical and computational sciences.

In particular, this research is relevant to the prevention and treatment of infectious disease, and to inherently complex and wide-ranging issues such as obesity and emergency preparedness and response.

Environment

Climate science investments are critical to improving our understanding of global climate variability and change, providing the basis for sound decision-making, and enabling the development of new, cleaner technologies. So as to better inform policy, agencies should continue to make investments to improve our ability to observe, model, assess, and adapt to impacts of climate change, particularly on a regional scale, and to assure the availability of critical long-term climate data. Agencies should continue supporting the goals of the 2003 *Strategic Plan for the U.S. Climate Change Science Program*; and align climate science investments with the specific priorities articulated in the Climate Change Science Program FY 2009 Interagency Implementation Priorities memo.

The NSTC Joint Subcommittee on Ocean Science and Technology released its strategic plan, *Charting the Course for Ocean Science in the United States: An Ocean Research Priorities Plan and Implementation Strategy* in 2007. Agencies should address the priorities in the Strategy to better inform and, therefore, improve our interactions with and stewardship of our valued ocean resources. In particular, agencies should give high priority to these four near term opportunities:

- forecasting the response of coastal ecosystems to persistent forcing and extreme events
- comparative analysis of marine ecosystem organization
- sensors for marine ecosystems
- assessing Atlantic Meridional Overturning Circulation variability, which has implications for rapid climate change

Agencies are also encouraged to align programs with *A Strategy for Federal Science and Technology to Support U.S. Water Availability and Quality* because of the importance of fresh water supplies to human health, environmental quality, and economic prosperity.

Global Earth observations play an important role in supporting research in a wide range of sciences important for society, and especially for the environmental priorities listed above. Agencies should refer to the *U.S. Strategic Plan for an Integrated Earth Observations System and Development of the U.S. Integrated Earth Observation System: Progress and Recommendations for the Way Forward* for guidance in contributing to these efforts. Agencies need to place a greater emphasis on coordinating their Earth observation activities. To ensure coordinated, long-term collection of critical land imaging data, agencies should respond to the recommendations of the Future of Land Imaging report in their budget requests.

Next Generation Air Transportation System

If conducting R&D related to the Nation's air transportation system, agencies should align their R&D efforts with the Next Generation Air Transportation System objectives to the maximum extent possible.

Federal Scientific Collections

Federal scientific collections play an important role in public health and safety, homeland security, trade and economic development, medical research, and environmental monitoring. Agencies are developing a coordinated strategic plan to identify, maintain and use Federal collections of physical objects and to further collections research. Agencies should participate in the finalization of this plan and in its subsequent implementation.

Science of Science Policy

Agencies should continue to participate in the interagency process to promote and coordinate individual and collaborative actions needed to develop the “science of science policy” for better assessing the impact of R&D investments, defining appropriate metrics for measuring this impact, understanding the effect of the globalization of science and technology, and improving the basis and capacity of Federal science policy decisions to achieve national goals.

Research and Development Investment Criteria

The President’s Management Agenda directs agencies to use the R&D investment criteria (relevance, quality, and performance) to improve investment decisions for and management of their R&D programs. Industry-relevant applied R&D must meet additional criteria. The specific activities programs should undertake to demonstrate fulfillment of the R&D investment criteria are described in a previous year’s memorandum, which is available at:

<http://www.whitehouse.gov/omb/memoranda/m03-15.pdf>

Many of these specific activities have been incorporated into the Program Assessment Rating Tool (PART). Agencies should use the criteria as broad guidelines that apply at all levels of Federally funded R&D efforts and the PART as the instrument to periodically evaluate fulfillment of the criteria at the program level.

The R&D investment criteria continue to:

- provide tools for programs, agencies, and policy makers to select, plan, and manage R&D programs effectively, to increase the productivity of the Federal R&D portfolio and the return on taxpayer investment;
- help convey the Administration’s expectations for proper program management;
- set standards for information to be monitored and provided in program plans and budget justifications; and
- ultimately improve public understanding of the potential benefits and effectiveness of the federal investment in R&D.