

Statement of Dr. John P. Holdren
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Executive Office of the President of the United States
to the
Committee on Appropriations
Subcommittee on Commerce, Justice, Science, and Related Agencies
United States House of Representatives
on
Research and Development in the President's Fiscal Year 2011 Budget
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Chairman Mollohan, Ranking Member Wolf, and Members of the Committee, It is my distinct privilege to be here with you today to discuss the R&D and STEM-education components of the President's FY2011 Budget.

Administration Initiatives in Science, Technology, and Innovation

The Obama Administration is working hard to keep the Nation on the path out of recession through recovery and into a new era of revitalized growth. This means sparking job creation to get millions of Americans back to work, and it means building a new foundation for long-term prosperity that will reach every American family. A crucial element of this effort is the targeted investments we're making in science, technology, and innovation (STI) that will lead to new products and services, new businesses and industries, and high-quality, sustainable jobs.

Our STI strategy includes investments in applied research and development that will lead to better technologies – and the jobs that will go with them – for advanced manufacturing, for clean energy, for health care, for environmental protection and remediation, and for national and homeland security. It includes increased use of public-private partnerships to speed up innovation and get the results more rapidly into the marketplace. And it includes investments in the foundations of national strength in STI:

- fundamental research and the facilities and equipment needed to do it;
- domains of exploration and discovery from the depths of the oceans to the frontiers of space, expanding our knowledge of our world and our universe while igniting the curiosity and ambitions of our young people; and
- science, technology, engineering, and math (STEM) education that will build on rather than stifle that curiosity and will enable those ambitions, giving us a bigger and better-prepared next generation of innovators, along with the tech-savvy workforce that competitiveness in the 21st century requires.

Because President Obama understands the crucial connections linking STI and STEM education to our ability to meet the great challenges before us, his 2011 Budget provides strong and strategic investments in these domains despite the overall budget austerity that the country's fiscal circumstances require. At a difficult time in the nation's history, the President's 2011 Budget proposes to invest in science, technology, and innovation today to meet the challenges of tomorrow. Obviously, we need the continued support of the Congress to get it done. In the

remainder of this testimony, I elaborate on the reasons the President and I are most hopeful you'll provide that support.

The Federal R&D Budget

The President's 2011 Budget proposes a record \$61.6 billion investment in civilian research and development, an increase of \$3.7 billion or 6.4 percent over the 2010 funding level, reflecting the Administration's firm belief that investment in innovation is the key to building the American economy of the future. This Budget builds on the 2009 and 2010 appropriations approved by Congress, and if passed as proposed would mark the third year in a row of real increases for Federal nondefense R&D and Federal research, following four years of real decline between 2004 and 2008.

These important R&D investments aim to bolster the fundamental understanding of matter, energy, and biology that are at the root of all innovation and to foster significantly new and potentially transformative technologies. While reducing some development funding and scaling back on R&D facilities and equipment, all told, the total (defense and nondefense) R&D budget would be \$147.7 billion, just \$343 million or 0.2 percent above the 2010 enacted level, or a 0.9 percent cut after adjusting for projected inflation.

Science is also fundamental to ensuring that Americans are safe and secure. That is why the Defense Department budget also devotes \$2 billion to basic research, considerably higher than in 2010, while reducing the Department's overall R&D budget by some \$3.5 billion—a reduction in spending achieved in large part by cutting lower-priority weapons-development programs.

Budgets of Science Agencies

The 2011 Budget also reflects the President's commitment to double the budgets of the National Science Foundation, a primary source of funding for basic academic research; the DOE's Office of Science, which leads fundamental research for energy and builds and operates accelerators, colliders, supercomputers, and facilities for making nano-materials; and the National Institute of Standards and Technology laboratories, which support a wide range of pursuits from accelerating standards development for health information technology and "smart grid" technologies to conducting measurement science research to enable net-zero energy buildings and advanced manufacturing processes.

The President's Plan for Science and Innovation and the America COMPETES Act have identified these three agencies as key to our nation's future prosperity and to preserving America's place as the world leader in science and technology. Although the previous Administration supported an effort to double these agencies' budgets between 2006 and 2016, these efforts fell short in 2007 and 2008. But last year, this Congress and this Administration worked together to finally put these agencies on a doubling trajectory, and the FY2011 budget maintains that trajectory with a 6.6 percent increase for their combined budgets, totaling \$13.3 billion.

I now turn to the budgets of individual agencies under this subcommittee's jurisdiction in a bit more detail.

National Science Foundation (NSF)

The National Science Foundation (NSF) is the primary source of support for academic research for most non-biomedical disciplines, funding basic research across the entire spectrum of the sciences and engineering. It is well regarded for funding nearly all of its research through a competitive, peer-reviewed process. The 2011 Budget requests \$7.4 billion for NSF, an increase of 6.9 percent in real terms above the 2010 funding level (8.0 percent in current dollars). This keeps NSF on track to double its budget as promised in the President's Plan for Science and Innovation. In addition, last year the Recovery Act provided \$3.0 billion for NSF.

Basic research funding is important not only because it leads to new knowledge and new applications but also because it trains the researchers and the technical workforce of the future. In recognition of this dual benefit to society and of NSF's special contribution, the 2011 Budget continues the President's commitment to triple the number of new NSF Graduate Research Fellowships to 3,000 a year by 2013. The 2011 Budget also requests \$64 million for the Advanced Technological Education (ATE) program to promote partnerships between higher-education institutions and employers to educate technicians for the high-technology fields that drive our nation's economy.

NSF also proposes to increase research funding to promote discoveries that can guide societal actions leading to environmental and economic sustainability. The Science, Engineering, and Education for Sustainability portfolio will increase to \$766 million in the 2011 Budget for integrated activities involving climate, environment, and energy. NSF is also committed to enhancing U.S. economic competitiveness with Science and Engineering Beyond Moore's law, a multidisciplinary research program designed to meet some of today's most daunting computational challenges.

NSF will also be collaborating with the Department of Energy (DOE) on the RE-ENERGYSE (Regaining our ENERGY Science and Engineering Edge) program to attract and educate future American scientists in the clean energy field. NSF's proposed contribution is \$19 million and DOE's is \$55 million in 2011.

National Aeronautics and Space Administration (NASA)

Our U.S. space program represents not just a grand and inspiring adventure of exploration and discovery looking outward at our universe, but also an indispensable platform for observing what is happening on the Earth below, a crucial element of our communications infrastructure and geopositioning capability; and a source of new products, services, businesses, and jobs whose potential is barely beginning to be tapped.

The FY2011 NASA budget launches a bold new space initiative that invests in American ingenuity to enable us to do things in space that are more useful, more affordable, and more exciting than returning astronauts to the Moon's surface 50 years after we did it the first time, using the last century's technology. The new approach – which adds \$6 billion over the next five years for NASA – includes a vigorous technology development and test program that will begin to reverse decades of under-investment in new ideas. By extending the life of the International Space Station, it increases the number of U.S. astronauts who will be working in space over the next decade; by supporting the development of private-sector capabilities to lift astronauts into low Earth orbit it will shorten the duration of our reliance solely on Russian launchers for this

purpose; and by investing in new, game-changing technologies it gives promise of getting our astronauts to deep space destinations sooner, faster, safer, and cheaper than what could realistically have been achieved under the old approach.

Let me provide some budget detail. The President's Budget supports the extension and enhanced utilization of the Space Station with a full complement of international crew and laboratories: it provides \$2.8 billion in 2011, \$463 million more than in 2010, to extend operations of the Space Station past its previously planned retirement of 2016, likely to 2020 or beyond. It funds a technology-demonstration program at \$7.8 billion over 5 years to support the development and demonstration of technologies to reduce the cost and expand the capabilities of future exploration activities, including in-orbit refueling and storage. There will be \$3.1 billion over 5 years for heavy-lift and propulsion R&D on new launch systems, propellants, materials, and combustion processes. And the Budget anticipates an investment of \$3.0 billion over 5 years to fund robotic precursor missions to scout exploration targets.

The Budget proposes \$5.0 billion in 2011 for the NASA's Science portfolio, an increase of more than \$500 million compared to 2010. This increase allows for numerous exciting scientific opportunities in space: re-flying the Orbiting Carbon Observatory (OCO), which is crucial to our understanding of the Earth's carbon cycle and its effect on climate change; accelerating the development of other satellites to enhance observations of the climate and other Earth systems; and continuing to increase our understanding of the cosmos through such projects as the follow-on to the Hubble Space Telescope.

Department of Commerce National Institute of Standards and Technology (NIST)

The National Institute of Standards and Technology (NIST) laboratories advance technological innovation through advanced measurement science research and standards development. The 2011 Budget of \$709 million for NIST's intramural laboratories, a 6.9 percent increase over the 2010 enacted level, will improve NIST's research capabilities by providing high-performance laboratory research and facilities for a diverse portfolio of research in areas such as advanced manufacturing, health information technology, cybersecurity, interoperable smart grid, and advanced solar energy technology. For NIST's extramural programs, the 2011 Budget requests \$130 million for the Hollings Manufacturing Extension Partnership (MEP), a \$5 million increase over the 2010 enacted level. The 2011 Budget also requests \$80 million for the Technology Innovation Program (TIP), a \$10 million increase over 2010. All of these NIST programs are important components of *A Framework for American Manufacturing*, a comprehensive strategy for supporting American manufacturers announced in December.

Department of Commerce National Oceanic and Atmospheric Administration (NOAA)

The National Oceanic and Atmospheric Administration (NOAA) plays a vital role in research on the Earth's oceans, atmosphere, and marine habitats. The NOAA budget of \$5.6 billion is an increase of \$806 million over the 2010 enacted level. This will allow NOAA to strengthen the scientific basis for environmental decision-making, improve weather and climate services that protect life and property, invest more heavily in restoring our oceans and coasts, and ensure satellite continuity.

NOAA satellite systems, which are essential to our understanding of weather and climate, are a top priority in the 2011 Budget. The large increase in the NOAA budget reflects a new architecture for the National Polar-orbiting Operational Environmental Satellite System (NPOESS). This tri-agency (NOAA, DOD Air Force, and NASA) program has had a long and troubled history. Since last August, OSTP has led an Executive Office of the President Task Force that, in close cooperation with the partner agencies, has been investigating various options for how to place the NPOESS program on a pathway to success. Last week, the three agencies announced a plan to restructure the program – a plan reflected in the President’s 2011 Budget. NOAA and the Air Force will no longer jointly procure NPOESS; rather, NOAA and NASA will take primary responsibility for procuring satellites for the afternoon orbit and DOD will take primary responsibility for the morning orbit. The three agencies will continue to partner in areas that have been successfully shared in the past, such as the program’s ground system. Although NOAA’s 2011 Budget proposes a substantial increase to support NOAA’s expanded NPOESS responsibilities under the restructuring, we intend to make full use of the NPOESS investments and work done to date by all the NPOESS parties. I can assure the committee that OSTP remains actively engaged in overseeing the transition to a new direction for this program and committed to ensuring continuity of satellite coverage needed for weather forecasting and storm tracking, as well as for climate data records.

White House Office of Science and Technology Policy (OSTP)

The White House Office of Science and Technology Policy (OSTP) works with OMB to ensure that the President’s S&T priorities are reflected in the budgets of all of the Executive Branch departments and agencies with S&T and STEM-education missions. OSTP also provides science and technology advice and analysis in support of the activities of the other offices in the Executive Office of the President and supports me in my role as the Assistant to the President for Science and Technology, with the responsibility to provide the President with such information about science and technology issues as he may request in connection with the policy matters before him. In addition, OSTP coordinates interagency research initiatives through administration of the National Science and Technology Council (NSTC), serves as the lead White House office in a range of bilateral and multilateral S&T activities internationally, and provides administrative and technical support for the very active 21-member President’s Council of Advisers on Science and Technology (PCAST).

OSTP personnel in addition to the Director include a Senate-confirmed Associate Director for Technology, who is also the Nation’s Chief Technology Officer; three further Senate-confirmed Associate Directors (for Science, Environment, and National Security and International Affairs); and a further 40 technical professionals plus supporting administrative staff. The 2011 Budget requests \$6.990 million for OSTP’s operations, slightly below the 2010 enacted funding level. This support for OSTP reflects the President’s continuing recognition of the importance and diversity of OSTP’s functions in keeping “science in its rightful place” in his Administration, as he pledged in his Inaugural Address.

Interagency Initiatives

A number of priority interagency S&T initiatives are highlighted in the President’s 2011 Budget. These initiatives are coordinated through the NSTC, which as noted above is administered by OSTP.

Networking and Information Technology R&D

The multi-agency Networking and Information Technology Research and Development (NITRD) Program plans and coordinates agency research efforts in cyber security, high-end computing systems, advanced networking, software development, high-confidence systems, information management, and other information technologies. The 2011 Budget provides \$4.3 billion for NITRD.

Networking and computing capabilities are more critical than ever for national and homeland security, reforming the health care system, understanding and responding to environmental stresses, increasing energy efficiencies and developing renewable energy sources, strengthening the security of our critical infrastructures including cyberspace, and revitalizing our educational system for the jobs of tomorrow. The 2011 Budget retains an important focus on investment in high-end computing research for both national security and large-scale scientific applications, particularly in advanced scalable simulations. The 2011 Budget also continues to emphasize foundations for assured computing and secure hardware, software, and network design and engineering to address the goal of making Internet communications more secure and reliable.

National Nanotechnology Initiative

The 2011 Budget provides \$1.8 billion for the multi-agency National Nanotechnology Initiative (NNI), a reduction of \$19.5 million from the enacted 2010 level. Research and Development in the NNI focuses on the development of materials, devices, and systems that exploit the fundamentally distinct properties of matter at the nanoscale. NNI-supported R&D is enabling breakthroughs in biomedical detection and treatment, manufacturing at or near the nanoscale, environmental monitoring and protection, energy conversion and storage, and novel electronic devices, among many others. The 2011 Budget proposes \$35 million for nano educational and societal dimensions research and \$101 million across several agencies for nanomanufacturing.

Consistent with the NNI Strategy for Nanotechnology-Related Environmental Health and Safety (EHS) Research, agencies maintain a focus on developing nanotechnology responsibly, with attention to the human health and environmental impacts as well as ethical, legal, and other societal issues. In recognition of the special importance of these issues, the 2011 Budget increases the priority of nano EHS research with a request of \$117 million, more than 27 percent above the 2010 level.

U.S. Global Change Research Program

The Budget includes an expanded commitment to global change research. Investments in climate science over the past several decades have contributed to an improved understanding of global climate. These additional investments will be a critical part of the President's overall strategy to mitigate U.S. greenhouse gas emissions and move toward a clean energy economy. To continue to assist the government and society to understand, predict, project, mitigate, and adapt to climate change, the 2011 Budget provides \$2.6 billion for the multi-agency U.S. Global Change Research Program (USGCRP), an increase of 21 percent or \$439 million over the 2010 enacted level.

The USGCRP was mandated by Congress in the Global Change Research Act of 1990 (P.L. 101-606) to improve understanding of uncertainties in climate science, expand global observing systems, develop science-based resources to support policymaking and resource management, and communicate findings broadly among scientific and stakeholder communities. Thirteen departments and agencies participate in the USGCRP. OSTP and the Office of Management and Budget (OMB) work closely with the USGCRP to establish research priorities and funding plans to ensure the program is aligned with the Administration's priorities and reflects agency planning.

In addition to enhancing research and modeling of the physical climate system, the 2011 USGCRP Budget will also allow for a comprehensive, coordinated focus on four areas of particular need: Earth observations, adaptation research, integrated assessment, and climate services.

Innovation, Entrepreneurship, and Job Creation

The President believes that we must harness the power and potential of technology, data, and innovation to transform the nation's economy and to improve the lives of all Americans. The President's 2011 Budget targets strategic investments in technology to spur innovation in the public and private sectors and does so in a manner that changes the way Washington works. Let me share with you a few key highlights.

As articulated in the President's *Strategy for Innovation* released last year, the Budget proposes a permanent extension of the research and experimentation (R&E) tax credit to spur private investment in research and development (R&D) by providing certainty that the credit will be available for the duration of the R&D investment.

The Budget also promotes the commercialization of promising technologies through smart, strategic investments. The Budget proposes \$12 million for the National Science Foundation (NSF) to support a new Innovation Ecosystem where universities will partner with other institutions to increase the impact of the most promising innovations through commercialization, industry alliances, and start-up formation. The Budget proposes an additional \$10 million in National Institute of Standards and Technology (NIST) programs to foster innovation in manufacturing with an emphasis on sustainable nanomanufacturing.

The Administration also recognizes that competitive, high-performing regional economies are the building blocks of national growth, and that we must expand and accelerate our efforts to cultivate regional economic clusters across the country. The Budget provides at least \$75 million in regional planning and matching grants within the Economic Development Administration (EDA) to support the creation of regional innovation clusters that leverage regions' competitive strengths to boost job creation and economic growth.

What I have given you is only a brief snapshot. As you know, there is important work being done in broadband, spectrum policy, patent reform, standards and measurements for emerging technologies, support for the development and adoption of health information technology, and export promotion. These efforts and investments will help build the foundation

for sustainable recovery, by fostering the new jobs and industries that will arise from the innovative and entrepreneurial talents of the American people.

Science, Technology, Engineering, and Mathematics (STEM) Education

The President has been emphatic about his commitment, which I share, to increase the participation and the performance of American students in science, technology, engineering, and mathematics, aiming to improve our performance in comparison with other nations from the middle of the pack to the top of the pack over the next decade. Over the past year, OSTP has been working with the White House Domestic Policy Council, the Department of Education, and a number of science and technology agencies to identify and promote concrete actions to help meet this ambitious goal.

The 2011 Budget invests \$3.7 billion in STEM education programs across the federal government, including a historic \$1 billion commitment to improve math and science achievement among K-12 students, that latter figure an increase of over 40 percent. The impact of these investments will be magnified by “Educate to Innovate”, a campaign launched by the President to motivate and inspire young people to excel in STEM education. This campaign has already mobilized over \$500 million in financial and in-kind support from companies, foundations, philanthropists, universities, non-profit organizations, and grassroots volunteers.

In addition to these investments, the Administration has made great strides in integrating STEM education into broader education programs. For example, the \$4.35 billion Race to the Top fund in the Recovery Act provides a competitive advantage to states that commit to a comprehensive strategy to improve STEM education. The 2011 Budget, by providing an additional \$1.35 billion in funding for Race to the Top, builds on these historic investments to create state capacity, focus on student achievement, and help prepare America’s students to graduate ready for college and careers.

This Administration is committed to investing in and scaling what works, and to improving the coordination of federal STEM education programs. The Department of Education and the National Science Foundation (NSF) are leading an effort, with active OSTP participation, to increase the impact of the Federal STEM investments I’ve outlined above by (1) developing an aligned strategy that emphasizes key agency capacities; (2) clarifying evidence standards used to assess program impact; and (3) identifying the most promising STEM efforts for further validation, testing, and suitability for scale-up. OSTP looks forward to working with this Committee on our common vision of improving STEM education for all of America’s students.

Conclusion

The investments in R&D and STEM education proposed in the President’s FY2011 Budget reflect his clear understanding of the critical importance of science, technology, and innovation in addressing the most compelling changes our Nation faces. While respecting the need for overall budgetary restraint under difficult economic conditions, the President is recommending an array of investments in R&D and STEM education that will keep this country on a path to revitalized economic growth, real energy security, intelligent environmental stewardship, better health outcomes for more Americans at lower costs, strengthened national

and homeland security, and continuing leadership in science and in space. I look forward to working with this Committee to make the vision of the President's FY 2011 Budget proposal into a reality. I will be pleased to try to answer any questions the Members may have.