

**U.S. HOUSE OF REPRESENTATIVES  
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY**

**HEARING CHARTER**

*An Overview of the Administration's Federal Research and Development Budget  
for Fiscal Year 2012*

**Thursday, February 17, 2011**

**10:00 a.m. - 12:00 p.m.**

**2318 Rayburn House Office Building**

**1. Purpose**

On Thursday, February 17, 2011, the House Committee on Science, Space, and Technology will hold a hearing to examine President Obama's proposed fiscal year 2012 (FY12) budget request for research, development, demonstration, and commercial application programs. Dr. John P. Holdren, Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy (OSTP), will review the proposed budget in the context of the President's overall priorities in science, space, and technology and will describe the mechanisms the Administration uses to determine priorities across scientific disciplines and the mechanisms used to coordinate scientific research and technical development activities across Federal agencies. The Committee will hold separate hearings to examine the FY12 budget requests of individual agencies within its jurisdiction over the next few weeks.

**2. Witness**

**Dr. John P. Holdren** is the Assistant to the President for Science and Technology and Director of OSTP, the White House science office. He also serves as Co-Chair of the President's Council of Advisors on Science and Technology (PCAST). Prior to joining OSTP, Dr. Holdren was the Teresa and John Heinz Professor of Environmental Policy and Director of the Program on Science, Technology, and Public Policy at Harvard University's Kennedy School of Government, as well as Director of Woods Hole Research Center.

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#### 4. Overview

##### *Overall Budget*

Under the President’s proposed budget for FY12, overall discretionary spending would decrease by 1.1 percent if Overseas Contingency Operations and Other Supplemental/Emergency Funding are included; otherwise, base discretionary spending would increase by 8.9 percent. These increases are weighted toward spending on defense and homeland security. A majority of other agencies see a reduction in discretionary spending. However, within the Committee’s jurisdiction, the Department of Energy’s Office of Science (9 percent), the National Science Foundation (13 percent), the National Institute of Standards and Technology (17 percent), and the National Oceanic and Atmospheric Administration (13 percent) are exceptions. Discretionary spending for NASA remains flat.

##### *Research and Development (R&D) Budget*

#### *Overall Federal Research and Development Spending<sup>1</sup>* (dollars in millions)

Agency	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
Department of Defense	80287	80602	77548	76633	(3969)	(5)
Department of Health and Human Services	29265	31424	32156	32343	919	33
Department of Energy	9807	10836	11219	12989	2153	20
NASA	11182	9262	10986	9821	559	6
National Science Foundation	4580	5445	5571	6320	875	16
Department of Agriculture	2336	2611	2448	2150	(461)	(18)
Department of Commerce	1160	1344	1727	1720	376	28
Department of Transportation	875	1069	1180	1215	146	14
Department of Homeland Security	995	887	1046	1054	167	19
Department of Veterans Affairs	960	1162	1018	1018	(144)	(12)
Department of the Interior	683	776	772	727	(49)	(6)
Environmental Protection Agency	551	590	651	579	(11)	(2)
Department of Education	-	353	383	480	127	36
Smithsonian Institution	-	213	236	212	(1)	-
Other	1074	565	755	650	85	15
<b>Totals:</b>	<b>143746</b>	<b>147139</b>	<b>147696</b>	<b>147911</b>	<b>772</b>	<b>1</b>

Shading indicates agencies within the Science, Space, and Technology Committee’s jurisdiction

The President’s FY12 budget proposes a total of \$147.9 billion for research and development (R&D) across all agencies, a \$772 million or one percent increase over the FY10 enacted level.<sup>2</sup>

<sup>1</sup> *Fiscal Year 2012 Analytical Perspectives, Budget of the U.S. Government*, OMB, p. 367.  
(<http://www.whitehouse.gov/sites/default/files/omb/budget/fy2012/assets/spec.pdf>)

The budget would decrease defense-related R&D spending by \$3.96 billion or five percent to \$76.6 billion and increase health-related R&D by \$919 million or three percent to \$32.3 billion. Therefore, the total non-defense R&D budget request is \$71.2 billion, but the total FY12 budget request for all other non-defense and non-health specific R&D, an overwhelming majority of which is in the Committee’s jurisdiction, is \$38.9 billion or a 10.8 percent increase over the FY10 enacted level. This amount includes basic and applied research, development, and facilities and equipment.

The President’s proposed FY12 budget does not treat R&D uniformly, but rather provides significant increases in priority areas, while reducing or freezing spending in other areas. Therefore, aggregate numbers mask the wide variation in individual agencies and programs. The budget request provides \$13.9 billion for the three physical science agencies included in America COMPETES – research funding at the National Science Foundation (NSF), internal programs at the National Institute of Standards and Technology (NIST) and the Department of Energy’s Office of Science (DOE). With the exception of the Environmental Protection Agency (EPA) R&D activities, which would be cut by two percent, and National Aeronautics and Space Administration (NASA) R&D, which would increase by six percent, all other agencies within the Committee’s jurisdiction receive significant increases of 14 percent or more.

## 5. Interagency Research Activities<sup>3</sup>

### *Interagency Research Activities Spending (dollars in millions)*

Interagency Program	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Actual	
					\$	%
National Nanotechnology Initiative (NNI)	1549	1931	1776	2132	201	10.4
Networking and Information Technology R&D (NITRD)	3572	3794	4261	3868	74	2
US Global Change Research Program (USGCRP)	1832	2122	2561	2568	446	20.3

### *National Nanotechnology Initiative (NNI)*

The Science, Space, and Technology Committee was instrumental in the development and enactment of the 21<sup>st</sup> Century Nanotechnology Research and Development Act of 2003 (P.L. 108-153), which authorized the NNI. The NNI focuses on R&D that creates materials, devices, and systems that exploit the fundamentally distinct properties of matter as it is manipulated at the nanoscale. There are currently 26 federal agencies that participate in NNI, with 15 of those agencies reporting a nanotechnology R&D budget. The House passed two measures that included reauthorization for the NNI program in the 110<sup>th</sup> Congress (H.R. 554, the National

<sup>2</sup> The FY10 enacted level does not include any carryover from the estimated \$21.5 billion in R&D funding in the American Recovery and Reinvestment Act (ARRA) (P.L. 111-5), which included \$10.4 billion for NIH; \$3.0 billion for NSF; \$5.5 billion for DOE; \$580 million for NIST; \$1.0 billion for NASA; and \$830 million for NOAA.

<sup>3</sup> Budget numbers and details for the NNI and NITRD programs are taken from the Innovation, Education and Infrastructure Fact Sheet provided by OSTP. (<http://www.whitehouse.gov/sites/default/files/microsites/ostp/FY12-rd-fs.pdf>). Details may change with the release of the Supplement to the budget for these two programs, which had not been cleared by OMB at time of charter publication.

Nanotechnology Initiative Amendments Act, and H.R. 5116, the America COMPETES Reauthorization Act). The Senate did not take up H.R. 554, and the NNI provision was dropped from the Senate-passed version of H.R. 5116, which was signed into law (P.L. 111-358).

The FY12 budget request for NNI is \$2.1 billion, an increase of \$201 million or 10.4 percent over the FY10 actual levels. The Administration's budget request includes funding for three signature initiatives: Nanoelectronics for 2020 and Beyond; Sustainable Manufacturing: Creating the Industries of the Future; and Nanotechnology for Solar Energy Collection and Conversion. The DOE contribution will increase to \$611 million, a \$237 million or 63 percent increase. Likewise, NASA sees a 64 percent increase, EPA an 11.9 percent increase, HHS a five percent increase, NSF a 2.5 percent increase and NIST a one percent increase. All other agency funding is reduced by a total of \$88 million.

### ***Networking and Information Technology R&D (NITRD)***

The Science, Space, and Technology Committee was also instrumental in the development of the multi-agency NITRD program through the High Performance Computing Act of 1991 (P.L. 102-194). The mission of the NITRD program is to accelerate progress in the advancement of computing and networking technologies and to support leading edge computational research in a range of science and engineering fields, including high-end computing systems and software, networking, software design, human-computer interaction, health IT, and cybersecurity and information assurance research activities. Information technology research continues to play a critical role in U.S. economic strength. Currently, 13 Federal agencies contribute funding to the NITRD program and additional agencies, such as the Department of Homeland Security (DHS), participate in planning activities. The House passed two reauthorization measures for the NITRD program in the 110<sup>th</sup> Congress (H.R. 2020, the Networking and Information Technology Research and Development Act, and H.R. 5116, the America COMPETES Reauthorization Act). The Senate did not take up H.R. 2020, and the NITRD provision was dropped from the Senate-passed version of H.R. 5116, which was signed into law.

The FY12 NITRD budget request is \$3.9 billion, a \$474 million or two percent increase over the FY10 actual level. The Administration request emphasizes the need for networking and computing capabilities for homeland security, reforming the health care system, understanding and responding to environmental stresses, increasing energy efficiencies and developing renewable energy sources, and revitalizing the educational system for the jobs of tomorrow. The Department of Defense (DOD) contribution is decreased by \$261 million or 19.9 percent, primarily from earmarks. NSF and DOE both have significant increases of \$153 million and \$108 million respectively. DHS has a 69.7 percent increase, the Department of Commerce has a 49.3 percent increase, and NASA has an 11 percent increase.

### ***Global Change Research Program (USGCRP)***

The FY12 budget requests \$2.6 billion for the interagency USGCRP, a \$446 million or 20.4 percent increase over FY10 enacted, bringing Federal climate research funding to the highest level ever. Started in 1989, the USGCRP is an interagency effort comprised of 13 departments and agencies. Activities of the USGCRP are grouped under the following areas: improving knowledge of Earth's past and present climate variability and change; improving understanding of natural and human forces of climate change; improving capability to model and predict future

conditions and impacts; assessing the Nation’s vulnerability to current and anticipated impacts of climate change; and improving the Nation’s ability to respond to climate change by providing climate information and decision support tools that are useful to policymakers and the general public.

## 6. Agency R&D Highlights

### National Aeronautics and Space Administration (NASA)

*National Aeronautics and Space Administration (NASA) Spending*  
(dollars in millions)

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
<b>Science Mission Directorate</b>	<b>4706.2</b>	<b>4493.3</b>	<b>5005.6</b>	<b>5016.8</b>	<b>523.5</b>	<b>11.6</b>
<i>Earth</i>	1280.3	1420.7	1801.8	1797.4	376.7	26.5
<i>Planetary</i>	1247.5	1341.3	1485.7	1540.7	199.4	14.8
<i>Astrophysics</i>	1337.5	1103.9	631.5 <sup>^</sup>	682.7	(421.2)	(38.2)
<i>James Webb Space Telescope</i>	545.4	441.4	444.8 <sup>^</sup>	373.7	(67.7)	(15.3)
<i>Heliophysics</i>	840.9	627.4	641.9	622.3	(5.1)	(0.8)
<b>Aeronautics</b>	<b>511.7</b>	<b>507.0</b>	<b>579.6</b>	<b>569.4</b>	<b>62.4</b>	<b>12.3</b>
<b>Space Technology</b>	--	<b>0.0</b>	<b>572.2</b>	<b>1024.2</b>	<b>1024.2</b>	--
<b>Exploration</b>	<b>3143.1</b>	<b>3779.8</b>	<b>4263.4</b>	<b>3948.7</b>	<b>168.9</b>	<b>4.5</b>
<i>Exploration R&amp;D</i>	--	0.0	1551.4	288.5	--	--
<i>Human Spaceflight Capabilities</i>	--	0.0	0.0	2810.2	--	--
<i>Commercial Spaceflight</i>	--	0.0	812.0	850.0	--	--
<i>Advanced Capabilities</i>	671.1	454.0	0.0	0.0	--	--
<i>Constellation Systems</i>	2471.9	3325.8	1900.0*	--	--	--
<b>Space Operations</b>	<b>5526.2</b>	<b>6180.6</b>	<b>4889.7</b>	<b>4346.9</b>	<b>(1833.7)</b>	<b>(30.0)</b>
<i>International Space Station</i>	1813.2	2317.0	2779.8	2841.5	524.5	22.6
<i>Space Shuttle</i>	3266.7	3139.4	989.1	664.9	(2474.5)	(78.8)
<i>Space &amp; Flight Support</i>	446.3	724.2	1119.0	840.6	116.4	16.1
<b>Education</b>	<b>146.8</b>	<b>183.8</b>	<b>145.8</b>	<b>138.4</b>	<b>(45.4)</b>	<b>(24.7)</b>
<b>Cross-Agency Support</b>	<b>3242.9</b>	<b>3095.1</b>	<b>3111.4</b>	<b>3192.0</b>	<b>96.9</b>	<b>3.1</b>
<b>Construction &amp; Environmental Compliance</b>	--	<b>448.3</b>	<b>379.3</b>	<b>450.4</b>	<b>2.1</b>	<b>0.4</b>
<b>Inspector General</b>	<b>32.6</b>	<b>36.4</b>	<b>37.0</b>	<b>37.5</b>	<b>1.1</b>	<b>3.0</b>
<b>Totals:</b>	<b>17309.4</b>	<b>18724.3</b>	<b>19000.0</b>	<b>18724.3</b>	<b>0.0</b>	<b>0.0</b>

\*To cover program shut-down costs.

<sup>^</sup>The FY11 request did not break out JWST from Astrophysics. To allow for comparison with FY12, the FY11 request has been redisplayed.

The FY12 budget request for NASA is \$18.7 billion, the same amount requested in FY10. Congress fully funded the agency’s request in the FY10 appropriations bill, a level which has continued to this day. For the four-year runout (FY13 – FY16), NASA’s budget projection assumes identical funding for each year – \$18.7 billion. However, the Office of Management and Budget (OMB) Blue Book and NASA’s own budget request disagree on out-year funding levels; NASA’s assumes four years of flat funding at \$18.7 billion; OMB’s out-year projections indicate budgets that are below the FY12 request.

The budget request assumes retirement of the Space Shuttle in FY11 and provides \$548 million in FY12 to cover pension costs associated with the contractor workforce that maintained the Shuttle fleet. The budget request also assumes operation and utilization of the International Space Station through at least 2020. NASA's FY12 budget proposes \$2.8 billion for development of the Congressionally-directed Space Launch System and the Orion-based Multi Purpose Crew Vehicle, which is \$1.2 billion less than authorized in the NASA Authorization Act of 2010 (P.L. 111-267). The 2010 Act reflected Congressional intent that NASA develop the Space Launch System and Multi Purpose Crew Vehicle as soon as possible to ensure U.S. access to the International Space Station should commercial crew and cargo capabilities fail to materialize. Furthermore, the FY12 budget proposal diverges from Congressional direction by seeking \$1.7 billion over two years (FY12 and FY13) for commercial crew, which is \$700 million above authorized levels. The proposal also tries to reinstate funding for the 21<sup>st</sup> Century Launch Complex, an initiative that Congress rejected in last year's bill.

The FY12 budget request responds to the NASA Authorization Act of 2010 (P.L. 111-267) in the area of science. The request reflects the scientific priorities of the National Research Council's decadal survey for Astrophysics. Because of the high scientific importance of the troubled James Webb Space Telescope (JWST) still under development, NASA has created a separate JWST line in its budget request to give the program closer scrutiny. Last summer an external review panel determined that JWST would require an additional \$1.5 billion in funding and an additional year of schedule before it would be ready for launch. NASA is currently performing a bottoms-up review, and for FY12 is requesting a reduction for JWST while it awaits final analysis.

**Department of Energy (DOE)**

***Department of Energy (DOE) Spending***  
*(dollars in millions)*

Program	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
<b>Office of Science</b>	<b>4083.0</b>	<b>4964.0</b>	<b>5121.0</b>	<b>5416.0</b>	<b>452.0</b>	<b>9.11</b>
<i>Advanced Scientific Computing Research</i>	351.0	383.2	426.0	465.6	82.4	21.5
<i>Basic Energy Sciences</i>	1270.0	1599.0	1835.0	1985.0	386.0	24.1
<i>Biological and Environmental Research</i>	544.0	588.0	627.0	717.9	129.9	22.1
<i>Fusion Energy Sciences</i>	287.0	417.7	380.0	399.7	(18.0)	(4.3)
<i>High Energy Physics</i>	689.0	790.8	829.0	797.2	6.4	0.8
<i>Nuclear Physics</i>	433.0	522.5	562.0	605.3	82.8	15.9
<b>Energy Efficiency and Renewable Energy (EERE)</b>	<b>1704.0</b>	<b>2242.5</b>	<b>2355.0</b>	<b>3200.0</b>	<b>957.5</b>	<b>42.70</b>
<i>Hydrogen Technology</i>	211.1	170.3	0.0	0.0	(170.3)	(100)
<i>Hydrogen and Fuel Cell Technologies</i>	0.0	0.0	137.0	100.5	100.5	n/a
<i>Biomass and Biorefinery Systems</i>	198.2	216.2	220.0	340.5	124.3	57.5
<i>Solar Energy</i>	168.5	243.4	302.4	457.0	213.6	87.8
<i>Wind Energy</i>	49.6	79.0	122.5	126.9	47.9	60.6
<i>Geothermal Technology</i>	19.8	43.1	55.0	101.6	58.5	135.7
<i>Water Power</i>	9.9	48.7	40.5	38.5	(10.2)	(20.9)
<i>Vehicle Technologies</i>	213.0	304.2	325.3	588.0	283.8	93.3
<i>Building Technologies</i>	109.0	219.0	230.7	470.7	251.7	114.9
<i>Industrial Technologies</i>	64.4	94.3	100.0	319.8	225.5	239.1
<b>Nuclear Energy R&amp;D</b>	<b>438.0</b>	<b>487.0</b>	<b>396.0</b>	<b>447.4</b>	<b>(39.6)</b>	<b>(8.1)</b>
<b>Electricity Delivery and Energy Reliability R&amp;D</b>	<b>82.8</b>	<b>168.5</b>	<b>144.3</b>	<b>192.8</b>	<b>24.3</b>	<b>14.4</b>
<b>Fossil Energy R&amp;D</b>	<b>888.5</b>	<b>659.3</b>	<b>760.0</b>	<b>453.0</b>	<b>(206.3)</b>	<b>(31.3)</b>
<b>ARPA-E*</b>	<b>n/a</b>	<b>0.0</b>	<b>300.0</b>	<b>650.0</b>	<b>650.0</b>	<b>n/a</b>
<b>Loan Guarantee Program Office</b>	<b>4.6</b>	<b>0.0</b>	<b>0.0</b>	<b>305.0</b>	<b>305.0</b>	<b>n/a</b>
<b>Totals:</b>	<b>7200.9</b>	<b>8521.3</b>	<b>8776.3</b>	<b>10014.2</b>	<b>1492.9</b>	<b>14.9</b>

\*\$100 million of the \$650 million ARPA-E request is proposed to be paid for through revenues collected from auction of wireless broadcast spectrum.

The Department of Energy funds a wide range of research, development, demonstration, and commercial application activities within the Science, Space, and Technology Committee's jurisdiction.

### *Office of Science (SC)*

The total FY12 budget request for the Office of Science (SC) is \$5.4 billion, a \$452 million or 9.1 percent increase over FY10 enacted and a \$295 million increase over the Administration's FY11 request. The mission of the Office of Science is the delivery of scientific discoveries, capabilities, and major scientific tools to transform the understanding of nature and to advance the energy, economic, and national security of the United States. In support of this mission, SC supports basic research in the following areas: advanced scientific computing, basic energy sciences, biological and environmental research, fusion energy sciences, high energy physics, and nuclear physics. SC's activities are in three main areas: selection and management of research; operation of world-class, state-of-the-art scientific facilities; and design and construction of new facilities. The Office of Science also supports several ongoing interagency initiatives such as the interagency NITRD program; the NNI; the USGCRP; and the Climate Change Technology Program (CCTP).

### *Advanced Research Projects Agency – Energy (ARPA-E)*

The Administration requests \$650 million for the Advanced Research Projects Agency – Energy (ARPA-E). Of this amount, \$550 million would be provided through discretionary funding. ARPA-E would also administer an additional \$100 million Wireless Innovation Fund (WIN) aimed at developing wireless communications technologies and paid for through a proposed transfer of wireless spectrum auction revenues.

Established in 2007 by the America COMPETES Act (P.L.110-69), ARPA-E is statutorily charged with developing energy technologies that result in “(i) reductions of imports of energy from foreign sources; (ii) reductions of energy-related emissions, including greenhouse gases; and (iii) improvement in the energy efficiency of all economic sectors.” Initially provided with \$400 million in American Recovery and Reinvestment Act (ARRA) (P.L.111-5) funding, ARPA-E did not receive a direct appropriation in FY10, though it was the beneficiary of a \$15 million transfer from the Office of Science.

In 2010, ARPA-E issued \$207.6 million in ARRA funds for 85 projects. These projects were awarded as a result of two funding opportunities. The six program areas funded in 2010 included Electrofuels, Batteries for Electrical Energy Storage in Transportation (BEEST), Innovative Materials & Processes for Advanced Carbon Capture Technologies (IMPACCT), Grid-Scale Rampable Intermittent Dispatchable Storage (GRIDS), Agile Delivery of Electrical Power Technology (ADEPT), and Building Energy Efficiency Through Innovative Thermodevices (BEET-IT).

### *Nuclear Energy*

The primary mission of the Office of Nuclear Energy (NE) is to “advance nuclear power as a resource capable of meeting the Nation's energy, environmental, and national security needs by resolving technical, cost, safety, proliferation resistance, and security barriers through research, development, and demonstration as appropriate.”<sup>4</sup>

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<sup>4</sup> All DOE mission statement quotes come from the cited office's website.



The FY12 budget request for NE R&D is \$447.4 million, a \$39.6 million or 8.1 percent decrease from FY10 enacted and a 10 percent decrease from the FY11 President's budget request. Approximately 74 percent of that request is dedicated to the Fuel Cycle R&D and Reactor Concepts RD&D programs.

The President's request includes funding for two new programs, \$97 million for Nuclear Energy Enabling Technologies (NEET) and \$67 million for a Small Modular Reactor Deployment program. NEET is intended to develop cross cutting technologies which can be applied to multiple reactor concepts and fuel cycle approaches. The Small Modular Reactor Deployment program is created to assist in the development and licensing of small modular reactors necessary for commercial deployment.

### ***Energy Efficiency and Renewable Energy (EERE)***

The mission of Energy Efficiency and Renewable Energy (EERE) is to "strengthen the United States' energy security, environmental quality, and economic vitality in public-private partnerships." EERE's stated goal is to support this mission through the following means: "Enhancing energy efficiency and productivity; Bringing clean, reliable and affordable energy technologies to the marketplace; and Making a difference in the everyday lives of Americans by enhancing their energy choices and their quality of life."

The Administration's budget request of \$3.2 billion for the Office of Energy Efficiency and Renewable Energy (EERE) represents a \$958 million or 44.4 percent increase from the FY10 enacted level and a \$845 million or 36 percent increase over the President's FY11 budget request. This reflects the President's call in his State of the Union speech for increased spending on clean energy technologies. Most EERE programs receive significant funding increases relative to the FY10 enacted level. Industrial Technologies receives a \$225 million or a 239 percent increase, which includes the creation of an Energy Innovation Hub on critical materials. Geothermal Technology would see an increase of \$58 million or 125 percent to expand the enhanced geothermal subprogram and Solar Energy would receive an additional \$213 million or 87.8 percent to fund the "Sunshot" and "dollar-a-watt" initiatives.

### ***Electricity Delivery and Energy Reliability***

The mission of the Office of Electricity Delivery and Energy Reliability (OE) is to "lead national efforts to modernize the electric grid; enhance security and reliability of the energy infrastructure; and facilitate recovery from disruptions to energy supply." Research and Development within OE would be funded at \$193 million in the President's FY12 budget request. This would reflect an increase of \$71.4 million or 58.8 percent from FY10 enacted levels and a \$48.5 million increase or 33.6 percent from the President's FY11 budget request. Additionally, the President requests \$20 million for the creation of a Smart Grid Technology and Systems Hub to be administered by OE.

### ***Fossil Energy***

The DOE Office of Fossil Energy (FE) supports R&D focused on coal (including clean coal technologies), gas, and petroleum and also supports the Federal government's Strategic Petroleum Reserve. The President's total budget request for the FE is \$520 million. FE's R&D

budget is reduced to \$453 million, a decrease of \$206 million or 31.3 percent from FY10 enacted levels. This correlates to a \$134 million or 22.3 percent decrease from the President's FY11 budget request.

The FY12 budget request proposes to terminate the Natural Gas Technologies and Unconventional Fossil Energy Technologies programs. Coal R&D is funded at \$291 million, the bulk of which is focused on advancing carbon capture and sequestration (CCS) efforts. The Hydrogen from Coal, Coal to Coal Biomass to Liquids, and Solid Oxide Fuel Cells subprograms would all be eliminated.

### ***Energy Innovation Hubs***

The FY12 budget request proposes funding of \$146 million for support six Energy Innovation Hubs, which are supported through the SC, EERE, and NE accounts. This would support the three existing Hubs and as well as the creation of three new Hubs, which the President highlighted in his recent State of the Union address. According to the Administration, Hubs are intended to “advance highly promising areas of energy science and engineering from the early stage of research to the point where the technology can be handed off to the private sector.”<sup>5</sup> The newly proposed Hubs are Batteries and Energy Storage (administered by the Office of Science, Basic Energy Sciences), Smart Grid Technology and Systems (administered by OE), and Critical Materials (administered by the Industrial Technologies Program at EERE).

### ***Loan Guarantee Program Office***

The President's FY12 budget request for DOE's Loan Guarantee Program Office (LPO) is \$200 million. This funding would be used as a credit subsidy for loans authorized under Section 1703 of the Energy Policy Act of 2005. The LPO did not receive an appropriation for credit subsidies in FY10. The credit subsidy funding would support an estimated \$1 to \$2 billion in loan guarantees to support energy efficiency and renewable energy activities.

Since its creation, the LPO has awarded over \$17.6 billion for 18 projects, in a wide variety of sectors such as solar generation, solar manufacturing, wind generation, wind manufacturing, geothermal, and transmission and energy storage.

In addition to the Title 17 loan guarantees, the President is requesting \$105 million to for the creation of a Better Building Pilot Loan Guarantee Initiative for Universities, Schools, and Hospitals. This program would fund loan guarantees to help retrofit commercial buildings and would be available to subsidize up to \$2 billion in total loan principal.

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<sup>5</sup> <http://www.energy.gov/hubs/>

## National Science Foundation (NSF)

### *National Science Foundation (NSF) Spending* (dollars in millions)

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
<b>Research and Related Activities (RRA)</b>	<b>4853.2</b>	<b>5563.9</b>	<b>6018.8</b>	6253.5	<b>689.6</b>	<b>12.4</b>
<i>Biological Sciences (BIO)</i>	615.6	714.5	767.8	794.5	79.6	11.2
<i>Computer and Info. Science and Engineering (CISE)</i>	535.3	618.8	684.5	728.4	109.6	17.7
<i>Engineering (ENG)</i>	649.5	743.9	825.7	908.3	164.4	22.1
<i>Geosciences (GEO)</i>	757.9	889.6	955.3	979.2	89.5	10.1
<i>Mathematical and Physical Sciences (MSP)</i>	1171.1	1351.8	1409.9	1432.7	80.9	6.0
<i>Social, Behavioral, and Economic Sciences (SBE)</i>	227.9	255.3	268.8	301.1	45.9	18.0
<i>Cyberinfrastructure (OCI)</i>	185.2	214.3	228.1	236.0	21.7	10.1
<i>International Science and Engineering (OISE)</i>	47.8	47.8	53.3	58.0	10.2	21.3
<i>Polar Programs (OPP)</i>	447.1	451.2	527.9	477.4	26.3	5.8
<i>Integrative Activities (IA)</i>	214.5	275.0	295.9	336.3	61.2	22.3
<i>U.S. Arctic Research Commission</i>	1.5	1.6	1.6	1.6	0	1.3
<b>Education and Human Resources (EHR)</b>	<b>766.3</b>	<b>872.8</b>	<b>892.0</b>	<b>911.2</b>	<b>38.4</b>	<b>4.4</b>
<b>Major Research Equipment &amp; Facilities Const (MREFC)</b>	<b>166.9</b>	<b>117.3</b>	<b>165.2</b>	<b>224.7</b>	<b>107.4</b>	<b>91.6</b>
<b>Agency Operations &amp; Award Management</b>	<b>282.0</b>	<b>300.0</b>	<b>329.2</b>	<b>357.7</b>	<b>57.7</b>	<b>19.2</b>
<b>National Science Board (NSB)</b>	<b>3.8</b>	<b>4.5</b>	<b>4.8</b>	<b>4.8</b>	<b>.3</b>	<b>6.6</b>
<b>Office of Inspector General (OIG)</b>	<b>11.8</b>	<b>14.0</b>	<b>14.4</b>	<b>15</b>	<b>1.0</b>	<b>7.1</b>
<b>Totals:</b>	<b>6084.0</b>	<b>6872.5</b>	<b>7424.4</b>	<b>7767.0</b>	<b>894.5</b>	<b>13.0</b>

The FY12 budget request for NSF is \$7.7 billion, an increase of 13 percent, or \$894.5 million over the FY10 enacted level (not including any carryover from the \$3 billion NSF received from ARRA funding). The request continues to keep NSF on a doubling path for funding as set out in the America COMPETES Act and America COMPETES Reauthorization Act. NSF provides approximately 20 percent of Federal support for all basic research at U.S. colleges and universities and is second only to National Institutes of Health (NIH) in support for all academic research. It is the primary source of federal funding for non-medical basic research, providing approximately 40 percent of all federal support, and serves as a catalyst for science, technology, engineering, and mathematics (STEM) education improvement at all levels of education. The budget for NSF is divided into three main accounts: Research and Related Activities, Education and Human Resources, and Major Research Equipment and Facilities Construction.

### ***Research and Related Activities (RRA)***

The FY12 budget request includes \$6.3 billion for Research and Related Activities (RRA), an increase of \$690 million or 12.4 percent over FY10 enacted. RRA is made up primarily of six

disciplinary directorates: non-biomedical life sciences (BIO); computer sciences (CISE); engineering (ENG); geosciences (GEO); math and physical sciences (MPS); and social, behavioral, and economic sciences (SBE). Each of these directorates get significant increases in the FY12 budget request ranging from six percent for MPS to 22.1 percent for ENG. New programs established as part of the increased research funding request for FY12 include \$35 million for a nanotechnology manufacturing initiative, \$40 million in next-generation robotics technologies, and \$96 million for an interdisciplinary program to eventually replace computer chip technologies. In addition, \$87 million is requested for advanced manufacturing activities including expanded university-industry research partnerships and regional innovation ecosystems and clean energy manufacturing research. Another \$117 million is requested for “cyber-infrastructure” activities to accelerate the pace of discovery and \$12 million for a “new program that will fund a suite of activities that promote greater interdisciplinary research.”

As part of the Science, Engineering and Education for Sustainability (SEES) program that crosses all NSF directorates and has a goal of advancing “climate and energy science, engineering, and education to inform the societal actions needed for environment and economic sustainability and sustainable human well-being,” the FY12 budget request is \$998.1 million, an increase of \$337.5 million or 51 percent.

In addition, the FY12 budget request also includes a plan to invest broadband spectrum receipts in a variety of areas, including \$150 million to NSF in FY12 and \$1 billion total over a 5-year period for targeted research on experimental wireless technology testbeds, more flexible and efficient use of the radio spectrum, and cyber-physical systems such as wireless sensor networks for smart buildings, roads, and bridges. NSF’s participation is a piece of the \$3 billion WIN fund.

### ***Education and Human Resources (EHR)***

The FY12 budget request for Education and Human Resources (EHR) is \$911 million, a \$38.4 million or 4.4 percent increase over FY10. The Administration continues to offer a mixed message regarding the treatment of EHR relative to the healthy increase for RRA. While calling for an investment of \$3.4 billion in STEM education activities across the federal government, a number of proven NSF initiatives are being eliminated, reduced, or reprogrammed to make way for new or expanded programs. Like last year’s request, the FY12 budget request continues to shift a greater responsibility for STEM education to the Department of Education while maintaining NSF primarily as a research agency.

New funding in the FY12 budget request includes an additional \$20 million for a Transforming Broadening Participation through STEM (TBPS) pilot program to seek innovative solutions for broadening participation in STEM at the undergraduate level. This is part of an overarching realigned program called Broadening Participation at the Core (BPAC), which also houses several underrepresented population programs. The BPAC program total request is \$156 million, a \$21 million or 23.3 percent increase over FY10. Research programs focused on gender and persons with disabilities have been moved from this Division to the Division of Research on Learning in Formal and Informal Settings and funding under the request is cut by 8.7 percent to \$17 million.

Additionally, the FY12 budget request includes \$40 million in funding for a new teacher-training research and development program, split evenly between K-12 teachers and undergraduate teachers. At the same time, the budget request for Noyce Scholarships is \$45 million, a decrease of \$10 million or 18.2 percent and the Math and Science Partnership is \$48.2 million, also a decrease of \$10 million or 17.2 percent. Likewise, the Administration's budget request places a high priority on Graduate Research Fellowships (GRF) by increasing the funding to \$134.6 million, a 31.2 percent increase over FY10, while essentially flatlining the Integrative Graduate Education and Research Traineeship Program (IGERT) at \$30.17 million and greatly diminishing the Graduate STEM Fellows in K-12 Education (GK-12) to \$27 million, a 45 percent cut.

***Major Research Equipment and Facilities Construction (MREFC)***

The FY12 budget request includes \$224.7 for the Major Research Equipment and Facilities Construction (MREFC) account. This is a 91.6 percent increase from FY10, but the FY10 amount does not include \$146 million provided in ARRA funding for the Advanced Technology Solar Telescope (ATST). A bulk of MREFC funding in FY12 includes \$87.9 million for the second year construction of the National Ecological Observatory Network (NEON), which will collect data across the U.S. on the impacts of climate change, land use change, and invasive species. Another \$102.8 million is requested for the fourth year of construction of the Ocean Observatories Initiative (OOI), an integrated network of instrumentation that will provide continuous and interactive access to the ocean. OOI also received \$157 million in ARRA funding in FY09.

**National Institute of Standards and Technology (NIST)**

***National Institute of Standards and Technology (NIST) Spending***  
*(dollars in millions)*

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
<b>Scientific &amp; Technical Research and Services (STRS)</b>	<b>440.5</b>	<b>515.0</b>	<b>584.5</b>	<b>678.9</b>	<b>163.9</b>	<b>31.8</b>
<b>Construction of Research Facilities (CRF)</b>	<b>160.5</b>	<b>147.0</b>	<b>124.5</b>	<b>84.6</b>	<b>(62.4)</b>	<b>(42.4)</b>
<b>Industrial Technology Service (ITS)</b>	<b>154.8</b>	<b>194.6</b>	<b>209.6</b>	<b>237.6</b>	<b>43.0</b>	<b>22.1</b>
<i>Technology Innovation Program (TIP)</i>	<i>65.2</i>	<i>69.9</i>	<i>79.9</i>	<i>75.0</i>	<i>5.1</i>	<i>7.3</i>
<i>Manufacturing Extension Partnership (MEP)</i>	<i>89.6</i>	<i>124.7</i>	<i>129.7</i>	<i>142.6</i>	<i>17.9</i>	<i>14.4</i>
<i>Advanced Manufacturing Consortia*</i>	--	--	--	12.3	12.3	100.0
<i>Baldrige Performance Excellence Program**</i>	<i>7.9</i>	<i>9.6</i>	<i>9.9</i>	<i>7.7</i>	<i>(1.9)</i>	<i>(19.8)</i>
<b>Totals:</b>	<b>755.8</b>	<b>856.6</b>	<b>918.6</b>	<b>1001.1</b>	<b>144.5</b>	<b>16.9</b>

\*new initiative

\*\*in FY11 funded under STRS account

In FY12, the Administration has requested a funding level of \$1 billion or a 16.9 percent increase from FY10 enacted funding for the National Institute of Standards and Technology (NIST). The

budget request would provide \$678.9 million for NIST's core Scientific and Technical Research and Services (STRS); \$84.6 million for Construction of Research Facilities (CRF); \$142.6 million for the Manufacturing Extension Partnership (MEP) program; and \$75.0 million for the Technology Innovation Program (TIP).

### ***Research and Facilities***

The FY12 NIST budget request is \$678.9 million for the Agency's Scientific and Technical Research Services (STRS), an increase of \$163.9 million or 31.8 percent, and includes \$168 million in specific initiatives to address national priorities related to cyber infrastructure, technology interoperability, nanotechnology, and advanced manufacturing and materials. The STRS FY12 request continues the Administration's plan to double funding for key basic research agencies.

The FY12 budget request for Construction of Research Facilities (CRF) is \$84.6 million, a 42.4 percent decrease from FY10 enacted. The significant decrease represents the completion of several major renovation projects at the laboratory facilities in Boulder, CO. CRF funding would support maintenance and repair of existing NIST buildings as well as continue the interior renovation efforts of the Boulder lab Building 1 (\$25.4 million).

### ***Industrial Technology Services (ITS)***

The \$142.6 million request for the Manufacturing Extension Partnership (MEP) program is a \$17.9 million or 14.4 percent increase from the FY10 enacted level. The MEP program is a public/private partnership run by Centers in all 50 states and Puerto Rico that provides technical assistance for small and medium-sized manufacturers to modernize their operations and adapt to foreign competition. MEP Centers are supported by equal contributions from federal funds, state funds, and industry client fees. The requested increase would expand the program in support of the Administration's initiatives to reinvent domestic manufacturing to create jobs and respond to future challenges and opportunities.

The FY12 request for the Technology Innovation Program (TIP) is \$75 million, a \$5.1 million increase over FY10 enacted. TIP awards cost-shared grants to small companies and joint ventures for the development of high-risk, high-reward technologies that meet critical national needs. This program was created by the 2007 America COMPETES Act but was not reauthorized in the 2010 America COMPETES Reauthorization Act (P.L. 111-358).

The Baldrige Performance Excellence Program (BPEP) would receive \$1.9 million less than FY10 enacted in the FY12 budget request, reflecting the Administration's goal of transitioning the program to privately funded sources. Baldrige provides criteria and evaluation of successful strategies and performance practices across an array of industries.

New in FY12 is the Advanced Manufacturing Technology Consortia (AMTech) Program, with a \$12.3 million request. Modeled after the Nanoelectronics Research Initiative (NRI), a partnership between NSF, NIST, industry, and universities across the nation, the AMTech program would align industry needs with university research in innovative manufacturing. The program would fund facilities, equipment, and research at universities and government laboratories to address long-term research needs of the manufacturing industry.

***Public Safety Innovation Fund***

The FY12 budget request includes a plan to invest broadband spectrum receipts in a variety of areas, including \$100 million annually provided to NIST for 2012-2016 for research supporting the development and promotion of wireless technologies to advance public safety, Smart Grid, and other broadband capabilities. NIST’s participation is a piece of the \$3 billion WIN fund.

**National Oceanic and Atmospheric Administration (NOAA)**

***National Oceanic and Atmospheric Administration (NOAA) Spending***  
*(dollars in millions)*

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
National Ocean Service	536.0	578.7	550.6	558.6	(20.1)	(3.5)
Oceanic and Atmospheric Research	398.0	449.1	464.9	212.0	(237.1)	(52.8)
National Weather Service	911.0	999.8	1003.2	988.0	(11.8)	(1.2)
National Environmental Satellite Data Information Service	955.0	1398.5	2209.0	2015.4	616.9	44.1
Climate Service	0.0	0.0	0.0	346.2	346.2	100.0
National Marine Fisheries Service	829.0	1008.2	992.4	997.5	(10.7)	(1.1)
Program Support	446.0	485.9	515.1	524.8	38.9	8.0
Transfers/Rescissions		(24.8)	(50.3)	(144.8)		
<b>Totals:</b>	<b>4075.0</b>	<b>4748.4</b>	<b>5554.5</b>	<b>5497.7</b>	<b>749.3</b>	<b>15.8</b>

The National Oceanic and Atmospheric Administration’s (NOAA) budget request for FY12 is \$5.5 billion, an increase of \$749 million or 15.8 percent above the FY10 enacted level. While the bulk of this increase is allotted for NOAA’s environmental satellite programs, the budget request also includes the largest reorganization of NOAA since its inception in 1970.

***NOAA Climate Service***

The FY12 request creates a new line Climate Service line office, with a budget of \$346.2 million. Much of the funding for the new Climate Service will be taken through a transfer of existing resources from the following line offices: Oceanic and Atmospheric Research (OAR), the National Environmental Satellite Data Information Service (NESDIS), and the National Weather Service (NWS). The FY12 budget request for OAR is \$212 million, a decrease of \$237.1 million or 52.8 percent, which reflects a significant amount of climate research moved into the new Climate Service. The NWS Climate Prediction Center and some observation networks are also transferred to the Climate Service, but the overall FY12 budget request for NWS is reduced only \$11.8 million or 1.2 percent from the FY10 enacted level of \$999.8 million. NESDIS will shift all its data centers to the Climate Service, and the budget request reflects the change in priorities in this line office by changing its name to the National Environmental Satellite Service (NESS). The FY12 budget request for NESS is \$2 billion, an increase of \$620 million or 44.1 percent above the FY10 enacted level.

***NOAA Polar Satellite Program***

The substantial bump in the FY12 budget request for NESS is due to the Joint Polar Satellite System (formerly the National Polar-orbiting Operational Environmental Satellite System (NPOESS)). The increased funding will permit the agency to continue work on its first satellite for mid-afternoon orbit coverage under the program. The balance of the funds permit NOAA to complete and launch the NPOESS Preparatory Project (NPP) satellite, which will now bridge the gap between NOAA's current satellites and the new generation.

As part of a tri-agency effort with NASA and DOD, NOAA funded the development of NPOESS, which is the next generation of polar-orbiting weather satellites that serve both civilian and military weather forecasting and climatology needs. However, NPOESS suffered a series of cost increases (from \$6.9 billion at the program's outset to the Government Accountability Office's (GAO) last estimate of \$15 billion) and schedule delays (some five years for the first satellite launch) that now threaten the continuity of reliable high-quality weather and climate data. Reviews of NPOESS have blamed the cost and schedule overruns on the program's organizational structure, which places direction and decision-making authority with an Executive Committee consisting of the three agencies, rather than with a single agency. In the FY11 budget, the Administration split the program into two separate efforts. NOAA and NASA will be responsible for the satellites flying in "afternoon" orbits (i.e. passing over sunlit regions of the Earth at local afternoon), while DOD will take control of the spacecraft flying early morning orbits. The program will continue to rely on European satellites for coverage in a third, late-morning orbit.

**Department of Homeland Security (DHS)**

***Department of Homeland Security (DHS) Spending***  
*(dollars in millions)*

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
Science and Technology Directorate	830.1	1006.5	1018.3	1176.4	169.9	16.9
Domestic Nuclear Detection Office	484.4	383.0	305.8	331.7	(51.3)	(13.4)
<b>Totals:</b>	<b>1314.5</b>	<b>1389.5</b>	<b>1324.1</b>	<b>1508.1</b>	<b>118.6</b>	<b>8.5</b>

The Science, Space, and Technology Committee has jurisdiction over all R&D within DHS, which is carried out by the Department of Homeland Security Science and Technology Directorate (DHS S&T) and the Domestic Nuclear Detection Office (DNDO). The S&T Directorate, created through language developed by the Science, Space, and Technology Committee in the Homeland Security Act of 2002 (P.L. 107-296), funds research, development, testing and evaluation (RDT&E) to improve homeland security and works to transfer relevant technologies to federal, state and local governments and the private sector. The Domestic Nuclear Detection Office was established by National Security Presidential Directive (NSPD)-43



and Homeland Security Presidential Directive (HSPD)-14 to provide a focal point addressing nuclear and radiological preventative measures. DNDO is dedicated to both the development and enhancement of the global nuclear detection architecture, the coordination of nuclear detection research and development, and the establishment of procedures and training for end users of nuclear detection equipment. The Committee also has jurisdiction over fire and earthquake and nuclear detection programs at DHS.

***Science and Technology Directorate***

The FY12 budget request for DHS S&T is \$1.2 billion and would increase by \$170 million or 6.9 percent from FY10 enacted.

Most of this increase reflects the transfer of R&D programs from the DHS Domestic Nuclear Detection Office (DNDO) to DHS S&T. The balance of the \$170 million increase is focused on the Laboratory Facilities and Research, Development, and Innovation accounts. The facility funding increase will support the initial construction of the National Bio and Agro-Defense Facility (NBAF), the replacement for the Plum Island Animal Disease Center. The request also would fund an increase of \$18 million for the Comprehensive National Cybersecurity Initiative to support research and development projects focused on strengthening the Nation’s cybersecurity.

Accounts that are reduced in the FY12 DHS S&T request are Acquisition and Operations Support by 37 percent and University Programs (eliminating funding for the National Transportation Security Center of Excellence) by 26 percent.

***Domestic Nuclear Detection Office***

Within the DNDO, the FY12 request drops overall by \$118.6 million or 13.4 percent and includes a transfer of \$108.5 million from the Transformational Research and Development account to the S&T Directorate. This request was also proposed in FY11. The move of radiological and nuclear research from DNDO to S&T will consolidate all DHS basic research within S&T and increase the efficiency and effectiveness of the research.

**Environmental Protection Agency (EPA)**

***Environmental Protection Agency (EPA) Spending***  
*(dollars in millions)*

Account	FY08 Actual	FY10 Enacted	FY11 Request	FY12 Request	FY12 Request versus FY10 Enacted	
					\$	%
Science and Technology	785.8	848.0	846.7	825.6	(22.4)	(2.6)
Office of Research and Development	*	596.7	605.7	584.1	(12.6)	(2.1)

\*EPA is unable to determine this figure.

The Environmental Protection Agency (EPA) FY12 budget request for Science and Technology (S&T) programs is \$826 million, a decrease of \$22 million or 2.6 percent from the FY10 enacted

levels of \$848 million. The S&T budget request incorporates funding for the Office of Research and Development (ORD) as well as science and technology programs in other line offices. The ORD FY12 budget request of \$584.1 million is a decrease of \$12.6 million or 2.1 percent reduction from the FY10 enacted level of \$596.7. Although there is not a significant difference from the FY10 enacted level, the FY12 budget request reprioritizes research areas within EPA, and requests a \$24.7 million increase for the Science to Achieve Results (STAR) fellowship program. This increase is offset by reductions to Ecosystem Research and Homeland Security Research.