The 2017 Budget: Investing in American Innovation

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“Sixty years ago, when the Russians beat us into space, we didn’t deny Sputnik was up there. We didn’t argue about the science, or shrink our research and development budget. We built a space program almost overnight, and twelve years later, we were walking on the moon. That spirit of discovery is in our DNA.”

- President Barack Obama

January 12, 2016
The 2017 Budget:

• Invests in R&D and innovation
• Accelerates the pace of innovation to create jobs
• Improves Americans’ health through innovation
• Moves toward cleaner American energy
• Takes action on climate change
• Prepares students with STEM skills
Investing in R&D

- $72.4 billion for non-defense R&D.
- $80.0 billion for defense R&D.
- $72.8 billion for (basic and applied) research.
- $8.0 billion for the National Science Foundation (NSF).
- $5.7 billion for the Department of Energy (DOE) Office of Science.
- $826 million for the National Institute of Standards and Technology (NIST) laboratories.
- $19.0 billion for NASA.
- $700 million for U.S. Department of Agriculture competitively-awarded extramural research grants in the Agriculture and Food Research Initiative.
## R&D in the President’s 2017 Budget

(budget authority in billions of current dollars)

<table>
<thead>
<tr>
<th></th>
<th>FY 2015 Actual</th>
<th>FY 2016 Enacted</th>
<th>FY 2017 Budget</th>
<th>Change FY 16-17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total R&amp;D</strong></td>
<td>138.3</td>
<td>146.1</td>
<td>152.3</td>
<td>4.2%</td>
</tr>
<tr>
<td><em>defense</em></td>
<td>71.7</td>
<td>76.6</td>
<td>80.0</td>
<td>4.4%</td>
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<tr>
<td><em>nondefense</em></td>
<td>66.5</td>
<td>69.5</td>
<td>72.4</td>
<td>4.1%</td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td>66.0</td>
<td>68.9</td>
<td>72.8</td>
<td>5.7%</td>
</tr>
<tr>
<td><em>defense</em></td>
<td>10.9</td>
<td>10.9</td>
<td>11.8</td>
<td>7.9%</td>
</tr>
<tr>
<td><em>nondefense</em></td>
<td>55.2</td>
<td>58.0</td>
<td>61.0</td>
<td>5.2%</td>
</tr>
<tr>
<td><strong>Development</strong></td>
<td>69.7</td>
<td>74.5</td>
<td>76.7</td>
<td>3.0%</td>
</tr>
<tr>
<td><em>defense</em></td>
<td>60.5</td>
<td>65.3</td>
<td>67.6</td>
<td>3.5%</td>
</tr>
<tr>
<td><em>nondefense</em></td>
<td>9.2</td>
<td>9.1</td>
<td>9.1</td>
<td>-0.8%</td>
</tr>
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</table>
FY 2009 figures include Recovery Act appropriations.
Research includes basic research and applied research.
February 2016 OSTP
Investing in Innovation for National Security

• $12.5 billion for DOD’s Science & Technology (S&T) program of basic research, applied research, and advanced technology development.

• $3.0 billion for the Defense Advanced Research Projects Agency (DARPA) to maintain DOD’s critical role in fostering breakthrough approaches for discovering promising technologies.

• The Budget invests in defense-related S&T across a diverse portfolio, including advanced manufacturing, energy, cybersecurity, robotics, a safe and secure nuclear arsenal, and autonomous and unmanned systems. The Budget promotes effective technology transfer from the Department of Defense.

• The Budget includes $318 million for civilian R&D to support innovative cybersecurity technologies.
Support advanced manufacturing R&D

• $2.0 billion in advanced manufacturing R&D in the 2017 Budget.
• These investments will expand R&D on innovative manufacturing processes, advanced industrial materials, and robotics.

Establish a national network of manufacturing innovation institutes

• The Budget builds on the 13 manufacturing innovation institutes already funded through 2016 with more than $250 million in additional discretionary funds to support 5 new institutes.
• The Budget includes a mandatory proposal of $1.9 billion to fund the remaining 27 institutes in the national network for a total of 45.
Accelerating Innovation for Industries of the Future

- The Budget provides strong support for R&D that is likely to create the foundations for the industries and jobs of the future. Examples include robotics, cyber-physical systems, big data, the Materials Genome Initiative, the National Nanotechnology Initiative, and engineering biology.

- The Budget supports investments in the National Strategic Computing Initiative, including from DOE ($285 million) and NSF ($33 million).

- The Budget expands our capabilities in the space industries of the future: $1.2 billion for the Commercial Crew program, $827 million for Space Technology, and $324 million for Advanced Exploration Systems to increase the capabilities of NASA, other government, and commercial space activities.

- The Budget proposes to simplify and expand the permanently-extended Research and Experimentation Tax Credit.
“Last year, Vice President Biden said that with a new moonshot, America can cure cancer. Last month, he worked with this Congress to give scientists at the National Institutes of Health the strongest resources they’ve had in over a decade. Tonight, I’m announcing a new national effort to get it done.”

- President Barack Obama

January 12, 2016
Improving Americans’ health through innovation in life sciences, biology, and neuroscience

• The National Cancer Moonshot begins this year with $195 million in new NIH cancer activities. The 2017 Budget proposes $755 million for new cancer-related research activities in NIH and FDA.

• The 2017 Budget provides $309 million for the Precision Medicine Initiative with funding from HHS agencies.

• The BRAIN Initiative will continue with a Federal commitment of $195 million from NIH, and a total Federal investment of nearly $450 million.

• $33.1 billion for the National Institutes of Health (NIH) to support high-quality, innovative biomedical research.
“But even if the planet wasn’t at stake; even if 2014 wasn’t the warmest year on record – until 2015 turned out even hotter – why would we want to pass up the chance for American businesses to produce and sell the energy of the future?

Now we’ve got to accelerate the transition away from dirty energy. Rather than subsidize the past, we should invest in the future.”

- President Barack Obama
January 12, 2016
Moving toward cleaner American energy

| Mission Innovation | • The Budget supports the United States’ participation in Mission Innovation. The 2017 Budget provides $7.7 billion in FY 2017 for clean energy R&D to meet the pledge to double clean energy R&D by 2021.  
  • $2.9 billion for DOE Energy Efficiency and Renewable Energy (EERE), $804 million for nuclear energy, and $500 million for ARPA-E. |
| Modernized electric grid | • $177 million for DOE Office of Electricity Delivery and Energy Reliability. |
| 21st Century Clean Transportation Plan | • A new mandatory proposal for clean transportation system deployment, including R&D funding.  
  • Includes $200 million in DOT for safety research to accelerate the development of autonomous vehicles and $100 million in NASA R&D for low-carbon-emission aircraft. |
Taking action on climate change in the 2017 Budget

• $2.8 billion for the U.S. Global Change Research Program (USGCRP).
• USGCRP supports research to improve our ability to understand, assess, predict, and respond to global change.
• The 2017 Budget supports an integrated suite of climate change observations, process-based research, modeling, sustained assessment, adaptation science activities, and climate preparedness and resilience strategies.
• USGCRP investments support the President’s Climate Action Plan.
“The bipartisan reform of No Child Left Behind was an important start, and together, we’ve increased early childhood education, lifted high school graduation rates to new highs, and boosted graduates in fields like engineering. In the coming years, we should build on that progress, by providing Pre-K for all, offering every student the hands-on computer science and math classes that make them job-ready on day one, and we should recruit and support more great teachers for our kids.”

- President Barack Obama

January 12, 2016
Preparing students with STEM skills

- $3.0 billion for Federal science, technology, engineering, and mathematics (STEM) education programs in the 2017 Budget.
- Agencies continue to implement the Federal STEM Education 5-Year Strategic Plan.
- $4 billion for states and $100 million for districts in the 2017 Budget for Computer Science For All to increase access to K-12 CS courses. NSF and the Corporation for National and Community Service are starting the effort this year with more than $135 million in investments.
- NSF invests $332 million for graduate fellowships, $59 million for graduate traineeships, and $109 million for improving undergraduate education in the 2017 Budget.
THANK YOU

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Backup Slides
## Arctic Highlights in the 2017 Budget

<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
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<tbody>
<tr>
<td>Coastal Resilience</td>
<td>• The Budget proposes a $2 billion Coastal Climate Resilience program that provides resources over 10 years for at-risk coastal States, local governments, and their communities to prepare for and adapt to climate change.</td>
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<td>• A portion of these funds would be set aside for unique circumstances some Alaskan communities are confronting such as relocation expenses for native villages threatened by rising seas and coastal erosion.</td>
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<tr>
<td>Denali Commission</td>
<td>• The Budget provides the Denali Commission $5 million to leverage and coordinate other Federal, State, and Tribal assistance (including about $250 million across the Budget) for developing and implementing solutions to climate impacts.</td>
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<tr>
<td></td>
<td>• The Budget also proposes additional flexibility by allowing the Denali Commission to use their appropriated funds toward the cost-share that some federal assistance program require.</td>
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<tr>
<td>Research &amp; Observing</td>
<td>• $63 million for NSF’s Arctic research program and $7 million for NOAA’s Arctic Observing Network.</td>
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<td>• These investments will lead to sustainable stewardship of the Arctic and strengthened decision-making based on science.</td>
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<td>Icebreakers</td>
<td>• $150 million for the U.S. Coast Guard for design of a heavy, polar-class icebreaker, accelerating the start of production activities by 2 years to 2020.</td>
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NASA in the 2017 Budget

• $19.0 billion for the National Aeronautics and Space Administration (NASA), prioritizing research and development, space technology, and other initiatives enabling the increased use and exploration of space.

• Develops the building blocks for ambitious deep space exploration by providing $8.4 billion for human exploration and space operations.
  – Keeps Space Launch System rocket and Orion spacecraft on track to send astronauts on deep space missions in the 2020s and beyond.
  – Reaffirms NASA’s commitment to its commercial crew program, which will provide safe and affordable transport for astronauts to the International Space Station.
  – Develops critical technologies for exploration, including new public-private partnerships to build habitat modules and systems that will enable extended duration human missions around the moon or to Mars.

• Improves our understanding of the Earth and the Universe.
  – Provides $2 billion for multiple Earth science missions to study Earth as a complex, dynamic system of diverse components.
  – Provides $3.6 billion for space science, including funding for the James Webb Space Telescope, the next Mars rover mission, and a mission to Jupiter’s moon Europa.
Next-Generation High-Performance Computing
Delivering on the President’s National Strategic Computing Initiative

Advance U.S. Leadership in High-Performance Computing

• Develop and deploy a capable exascale system that addresses 21st century applications.

• Advance core computing technologies and paradigms for a post-Moore’s law world.

• Investments from multiple Federal agencies in the 2017 Budget, including DOE ($285 million) and NSF ($33 million).

Enable scientific discoveries, economic prosperity, and national security

• Broad deployment of NSCI will bring the economic and scientific benefits of HPC to more businesses, researchers, and government.

• Public and private-sector collaboration is key to NSCI developments.
Investing in Innovation for Cybersecurity

- The Budget includes $318 million for civilian R&D to support innovative cybersecurity science and technologies that support the goals in the 2016 Federal Cybersecurity R&D Strategic Plan:
  - Near-term advances that counter adversaries’ asymmetrical advantages with effective and efficient risk management
  - Mid-term advances that reverse adversaries’ asymmetrical advantages, through sustainably secure systems development and operation
  - Long-term advances for effective and efficient deterrence of malicious cyber activities via denial of results and likely attribution

- Achieving these goals strengthens the defensive elements of Deter, Protect, Detect, and Adapt.
Empower job seekers, trainers, providers, and researchers with good data to make smart choices.

Creating Pathways to High-Growth Jobs in the 2017 Budget
Empowering workers to invest in skills training for in-demand jobs

- $500 million to create Workforce Data Science and Innovation Fund to invest in technology and data analytics which tie training investments to employment outcomes.
- These investments will spur data products on jobs and skills to provide more comprehensive views of local labor market demands.
- New data standards, analytical data sets and open source data products will ensure continued innovation.

Empower States to share training and employment data for clearer picture of workforce investments

- $40 million in Workforce Data Quality Grants for states to integrate or bridge data systems and leverage common solutions to match training, earnings, and employment outcomes data.
- $2.5 million to modernize data collection on occupations and required job skills through the Occupational Information Network (O*Net).
- These investments will promote better skills matching for jobs across the public and private sector.
Lab-to-Market Funding Highlights for 2017
Supporting Commercialization of Federally-Funded R&D

The President’s Budget

• $50 million mandatory funding for Partnership Fund at EDA joining Federal labs, universities, and regional economic development organizations

• $35 million for R&D commercialization programs at NASA

• $30 million for NSF I-Corps to scale entrepreneurship training for Federally-funded scientist teams

• $8.4 million for DOE Office of Technology Transitions to expand Lab-to-Market collaborations

• $8 million for NIST to support government-wide Lab-to-Market projects, including open data on lab assets

• $1.9 million for the Lab-to-Market Cross-Agency Priority (CAP) Goal for “lab partnering service” at DOE

• I-Corps expanding through 10 agency partnerships

Building on Progress
Water S&T Highlights in the 2017 Budget

• $45 million of new funding for the Department of Energy to launch an Energy-Water Desalination Hub and conduct complementary R&D.

• $98.6 million for the Department of the Interior’s WaterSMART program, which promotes water conservation initiatives, improved water data, and technological breakthroughs.

• $88 million for the National Science Foundation (NSF) to support basic water research to enhance the scientific and engineering knowledge base.
Earthquake Early Warning in the 2017 Budget

Making America resilient to potential disasters

Make an earthquake early warning system an operational reality

- $8.2 million for the USGS to transition the earthquake early warning demonstration project into an operational capability on the West Coast.

- This investment is leveraged with state, university and private sector investments as part of a whole-of-government/whole community approach to achieving resilience.

Take a whole-of-government, whole-of-community approach

- USGS and partners have been conducting research to develop the ShakeAlert system since 2006.
- As of February 1st, it has moved to beta-test status in its transition toward full operations, when it will deliver fast, reliable, public warnings about oncoming earthquakes.

Builds on more than 9 years of federal, state, university, and private-sector R&D investments
ShakeAlert will give enough warning time to slow and stop trains and taxiing planes, stop surgeries, stop elevators and open doors, shut down industrial processes, and ensure that people understand what is coming, stop dangerous activities, and drop, cover, and hold on.
Smart Cities Initiative in the 2017 Budget

Solving pressing urban challenges through innovation

- $28 million for Smart and Connected Communities research at NSF.
- These investments will integrate new digital tools and engineering solutions into the physical world to solve urban challenges.
- Millions in related investments focused on cyber physical systems and the “Internet of Things.”

Support core Smart Cities R&D

- The Budget would create the Metropolitan Systems Initiative at DOE with $15 million in initial investment.
- This investment will deploy data-driven tools to support the creation of low-energy, resilient infrastructure and will enable U.S. cities to achieve their climate and energy targets.

Meet urban climate and energy goals
NOAA Coastal Resilience Grants

$20 Million in Competitive Grants in FY17

- These grants will support important projects that impact human and ocean health. National Ocean Policy regions, as well as other areas, will benefit.

- State, local, tribal, private, and NGO partners are all eligible for these grants.

- Projects could include
  - vulnerability assessments,
  - disaster preparedness, and
  - environmental restoration.

- Grants can also be used to implement marine regional plans through Regional Ocean Partnerships.

- $20 million represents a four-fold increase above the 2016 enacted level for these grants, which furthers both the need and enthusiasm for coastal resilience projects.

- Results will provide tangible examples and best practices for coastal resilience, from which communities can learn and benefit.
Federal Oceanographic Fleet Recapitalization Initiative

$230 Million in FY17

**NSF**
- $106 million to fund the construction of two Regional Class Research Vessels (RCRVs)
- Meet anticipated ocean science requirements for the U.S. East Coast, West Coast, and Gulf of Mexico.

**NOAA**
- $24 million to complete the construction of a Regional Survey Vessel (RSV)
  - part of a multi-year NOAA ship fleet recapitalization initiative.
  - RSVs conduct critical mission in areas including hydrography, fisheries sampling and acoustics, and ocean sensing and monitoring.
- $100 million in mandatory funding to acquire a second NOAA RSV
Ocean Acidification

$22 Million in FY17

NOAA

• Almost double the 2016 level ($12 million), to address this complex issue and increase our understanding of the consequences of ocean acidification on marine resources.
Growing a Network of Agency Innovation Labs

- Over $10 million in funding for a network of agency innovation labs.

- Goal: Developing internal agency capacity to increase the effectiveness and efficiency of government operations.

- Innovation labs provide the resources, training and mandate for agency employees to tackle complex challenges with new approaches that improve performance through innovation.
Investing in research to help unlock the mysteries of the brain

The 2017 Budget builds on the past three years of investment with $439 million for the BRAIN Initiative across six agencies:

1. NIH: $195 million for projects to create a dynamic picture of the brain in action.
2. DARPA: $118 million to provide neurotechnology-based capabilities to alleviate the burden of illness and injury.
3. NSF: $74 million to generate an array of physical and conceptual tools to determine how healthy brains function across the lifespan.
4. IARPA: $43 million for applied neuroscience research to advance understanding of the brain, develop non-invasive neural interventions, and build novel computing systems to employ neurally-inspired components.
5. DOE (new): $9 million to harness the power of the National Laboratories for tool development.
6. FDA: Supporting the BRAIN Initiative by enhancing the transparency and predictability of the regulatory landscape for neurological devices and assisting developers and innovators of medical devices.

Federal Investment in the BRAIN Initiative as of October 2015
Source: WhiteHouse.gov
Collecting high-resolution elevation data

• U.S. Geological Survey (USGS) coordinates the 3D Elevation Program (3DEP), an initiative to collect high-quality elevation data to inform land management, conservation, infrastructure development, agricultural practices, and other public and private decisions.

• The 2017 budget for the National Geospatial Program at USGS is $69.0 million, with program increases of $5.9 million above the 2016 enacted level, including $1.5 million for 3DEPAntaika mapping and $2.4 million for the national 3DEP program.

• Additional increases include $500,000 to use Light Detection and Ranging (LIDAR) data for landscape level assessments in the Chesapeake Bay, and $500,000 to use LIDAR data for improving disaster response regarding coastal infrastructure.

• Accelerating national elevation data coverage will enable decision-makers to manage infrastructure and construction, provide more accurate and cost effective application of chemicals in farming, help to develop energy resources, and support aviation safety and vehicle navigation.

• USGS and other federal agencies are also using a Broad Agency Announcement to coordinate the acquisition of elevation data to maximize the return on federal investment and avoid duplication.