



Research Infrastructure in the President's 2017 Budget

A Report to Congress on Federal Investments in Research-Facilities Construction and Major
Research Instrumentation

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Office of Science and Technology Policy

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Summary

The President's 2017 Budget proposes to invest \$2.8 billion in research infrastructure, defined as support for research and development (R&D) facilities construction, renovation, and the purchase of major capital equipment for R&D. The Committee on Science of the National Science and Technology Council is monitoring the progress of research-facilities construction and maintenance as well as procurement of major instrumentation. The Committee's work is informed by the results of the National Science Foundation's survey of science and engineering facilities at academic institutions. The survey, which was last conducted in fiscal year (FY) 2013 and released in mid-2015, provides a comprehensive national assessment of academic research infrastructure. The Committee's work will also be informed by ongoing dialogue between Federal agencies on the state of research infrastructure in Federal intramural and contractor-operated facilities.

Federal Investments in Research Infrastructure

As part of the annual Federal budget, Federal agencies are required to report their investments in R&D to the Office of Management and Budget (OMB) according to the guidelines and definitions established in OMB Circular A-11 Schedule C. Within agencies' R&D portfolios, OMB Circular A-11 requires agencies to distinguish between conduct of R&D (further divided into basic research, applied research, and development), research and development facilities, and major equipment for R&D based on the definitions in Appendix 1. While there is some inconsistency in how agencies interpret A-11 guidelines, these data do not necessarily include investments in support infrastructure and facilities that are necessary for the conduct of research and development, including at National laboratories, such as office buildings or other non-customized research support facilities.

These agency-reported data are published annually as part of the Budget of the U.S. Government. For the 2017 Budget, these data appear in the Analytical Perspectives volume of the *Budget of the U.S. Government Fiscal Year 2017* in Chapter 19, Research and Development. (The Budget data are presented in Table 19-1.) Table 1 of this report reproduces the data for Fiscal Years 2015, 2016, and 2017 on Facilities and Equipment from the Research and Development chapter. (Although the Circular A-11 provides standard definitions for the various categories of R&D, there are minor inconsistencies among Federal agencies in how they classify programs as conduct of R&D, major equipment for R&D, and R&D facilities construction. Some of these inconsistencies are noted in this report.)

Table 1. R&D Facilities Construction and Major Capital Equipment by Agency
(budget authority in millions of dollars)

| | FY 2015 Actual | FY 2016 Estimate | FY 2017 Budget | Change FY 16-17 | |
|--|-------------------|---------------------|-------------------|-----------------|-------------|
| | | | | Amount | Percent |
| R&D Facilities Construction and Major Capital Equipment for R&D | | | | | |
| Defense (military) | 116 | 33 | 195 | 162 | 490.9% |
| Health and Human Services | 173 | 180 | 223 | 43 | 23.9% |
| <i>Nat'l Institutes of Health</i> | 146 | 153 | 188 | 35 | 22.9% |
| NASA | 64 | 137 | 137 | 0 | 0.0% |
| Energy | 990 | 1,112 | 1,138 | 26 | 2.3% |
| <i>Nondefense Programs</i> | 699 | 800 | 795 | -5 | -0.6% |
| <i>Defense Programs</i> | 271 | 293 | 319 | 26 | 8.9% |
| Nat'l Science Foundation | 375 | 424 | 459 | 35 | 8.3% |
| Agriculture | 168 | 357 | 225 | -132 | -37.0% |
| Commerce | 231 | 400 | 331 | -69 | -17.3% |
| NOAA | 151 | 251 | 206 | -45 | -17.9% |
| NIST | 80 | 149 | 125 | -24 | -16.1% |
| Interior | 36 | 2 | 2 | 0 | 0.0% |
| Transportation | 25 | 35 | 35 | 0 | 0.0% |
| Environ. Protection Agency | 5 | 5 | 5 | 0 | 0.0% |
| Homeland Security | 315 | 8 | 0 | -8 | -100.0% |
| Smithsonian | 36 | 32 | 33 | 1 | 3.1% |
| Total R&D Facils. & Capital Equip. | 2,534 | 2,725 | 2,783 | 58 | 2.1% |

Federal agencies not listed do not report R&D facility construction or major capital equipment spending.

The data in Table 1 show that the Federal Government makes substantial investments in the construction and major upgrade of the Nation's scientific facilities and the Nation's stock of major research instrumentation. Agency proposals in the 2017 Budget include \$2.8 billion for R&D facilities and R&D major equipment within a \$145.7 billion Federal R&D portfolio. The \$2.8 billion total in the 2017 Budget is an increase of \$58 million from the \$2.7 billion 2016 enacted funding level.

R&D Facilities Construction funds in the Department of Defense (DOD), the U.S. Department of Agriculture (USDA), the National Institutes of Health (NIH), the Smithsonian Institution (SI), and the National Institute of Standards and Technology (NIST) will be devoted to Federal or Federally Funded Research and Development Center (FFRDC) facilities. National Science Foundation (NSF) funds will support construction projects managed by the extramural research community. The

Department of Energy (DOE) supports construction primarily at FFRDC facilities, though some DOE construction funding is also managed by the extramural research community.

In addition to investments in the construction of R&D facilities, the 2017 Budget proposes funding to support major capital equipment for R&D. Nearly all of these investments are equipment purchases for intramural or FFRDC (Federally owned, contractor operated) laboratories. Customarily, these equipment and instrumentation purchases are funded out of general program funds rather than separate programs for equipment and instrumentation. One exception is the NSF's Major Research Equipment and Facilities Construction (MREFC) account; the 2017 Budget proposes \$193 million for 3 projects to support the acquisition, construction, and commissioning of major research facilities and equipment that provide unique capabilities at the frontiers of science and engineering. Other NSF support of major capital equipment for R&D is funded within the Research and Related Activities (R&RA) account.

Some Federal agencies support major capital equipment for R&D in the extramural research community through general program funds. There are also dedicated funds in the 2017 Budget to support major research instrumentation acquisitions in the extramural research community. Examples of such funding include the programs listed below:

National Science Foundation, Major Research Instrumentation, \$90 million

NSF's Major Research Instrumentation (MRI) program is an NSF-wide, crosscutting program that strengthens the U.S. scientific enterprise by investing in state-of-the-art research instrumentation at the Nation's institutions of higher education, research museums, and non-profit research organizations. The MRI program promotes the acquisition and development of instrumentation for shared use. MRI funds are awarded through a competitive, merit review process based on proposals. The 2017 Budget proposes \$90 million for the MRI program.

Department of Defense, Defense University Research Instrumentation Program, \$43 million

The Department of Defense's (DOD) Defense University Research Instrumentation Program (DURIP) funds competitive grants for research instrumentation to enhance universities' capabilities to conduct world-class research critical to DOD needs. DURIP generally funds equipment in the \$50 thousand to \$1 million range. DURIP is funded by the three services (Army, Navy, and Air Force) in each service's University Research Initiatives (URI) program. The 2017 Budget proposes \$43 million combined for DURIP (\$8 million Army, \$21 million Navy, and \$15 million Air Force).

In addition to these dedicated programs, other Federal programs offer support for research instrumentation as part of general infrastructure support. The National Science Foundation's (NSF) Experimental Program to Stimulate Competitive Research (EPSCoR) program, for example, proposes \$139 million in the 2017 Budget for its Research Infrastructure Improvement (RII) program of awards to strengthen academic research infrastructure to institutions in EPSCoR-eligible states. While the program does not generally fund research instrumentation exclusively,

the program does support awards for instrumentation as part of complex, multifaceted statewide awards to develop research infrastructure. The Office of the Director (OD) within the NIH supports the Shared Instrumentation/High-End Instrumentation Grants programs. Although these programs are not typically included in the annual R&D budget survey of major capital equipment for R&D funding, these one-year awards help NIH-supported investigators acquire commercially available equipment, typically too costly to obtain through a research project grant.

National Coordination of Research Infrastructure

The Office of Science and Technology Policy (OSTP) and Federal agencies, in coordination with the Office of Management and Budget (OMB), are taking steps to provide national strategic coordination of research infrastructure through the National Science and Technology Council (NSTC). The Committee on Science of the NSTC is the primary mechanism for this interagency effort.

For extramural facilities, the Committee's work is informed by the results of the National Science Foundation's survey of science and engineering facilities at academic institutions, last conducted in FY 2013 and published in June 2015 as *Science & Engineering Research Facilities: Fiscal Year 2013*. The FY 2013 survey found that U.S. academic institutions had 212 million net assignable square feet of science and engineering research space, continuing a steady upward trend from previous years (for example, 202 million net assignable square feet in the FY 2011 survey). At that time, academic institutions estimated that the backlog (deferred plans) of renovation or replacement of facilities in their institutional plans totaled \$5.4 billion.

For government research facilities, including FFRDCs, the Committee's work will be informed by the Federal Real Property Profile (FRPP), an inventory of non-classified real property assets under the custody and control of Federal executive branch agencies that is maintained by the General Services Administration (GSA) in consultation with the OMB-chaired Federal Real Property Council (FRPC). The FRPP tracks information about Federal laboratories and Federal R&D facilities, including their size and location. The Committee's work will also be informed by ongoing dialogue with GSA, the FRPC, OMB, and Federal agencies on the state of research infrastructure in Federal laboratory and R&D facilities.

Conclusion

The President's 2017 Budget proposes a substantial Federal investment of \$2.8 billion in research infrastructure. The Committee on Science of the National Science and Technology Council will continue ongoing coordinated interagency assessments of the state of research infrastructure to assess its ability to support national research priorities and areas relevant to the specific mission requirements of Federal agencies.

Appendix 1.

Definitions of conduct of R&D, R&D facilities, and major equipment for research and development (reproduced from the June 2015 edition of OMB Circular A-11):

Conduct of research and development in OMB Circular A-11:

Research and development (R&D) activities comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.

Include:

Administrative expenses for R&D, including the operating costs of research facilities and equipment.

Exclude:

Physical assets for R&D such as R&D equipment and facilities.

Routine product testing, quality control, mapping, collection of general-purpose statistics, experimental production, routine monitoring and evaluation of an operational program, and the training of scientific and technical personnel.

Research and development facilities in OMB Circular A-11:

Amounts for the construction and rehabilitation of research and development facilities. Includes the acquisition, design, and construction of, or major repairs or alterations to, all physical facilities for use in R&D activities. Facilities include land, buildings, and fixed capital equipment, regardless of whether the facilities are to be used by the Government or by a private organization, and regardless of where title to the property may rest. Includes fixed facilities such as reactors, wind tunnels, and particle accelerators.

Major equipment for research and development in OMB Circular A-11:

Amounts for major equipment for research and development. Includes acquisition or design and production of movable equipment, such as spectrometers, research satellites, detectors, and other instruments. At a minimum, this line should include programs devoted to the purchase or construction of R&D equipment.

The R&D facilities category listed above is also known as “R&D facilities construction.” The Major equipment for R&D category listed above is also known as “major capital equipment for R&D” and includes major research instrumentation. In this report, the terms “major equipment for R&D” and “major research instrumentation” are used interchangeably. These two categories are commonly combined into one category known variously as “R&D plant” or “research infrastructure” or “R&D facilities and equipment” or “R&D Facilities Construction and Major Capital Equipment for R&D.”