Federal Funds for Research and Development: Fiscal Years 2016–17

Christopher Pece
Project Officer
Research and Development Statistics Program
703-292-7788
cpece@nsf.gov

Technical Notes

Survey Overview

Purpose. The annual Survey of Federal Funds for Research and Development (Federal Funds Survey) is the primary source of information about federal funding for R&D in the United States. The results of the survey are used to help implement four federal programs: the Federal Laboratory Consortium for Technology Transfer, Small Business Innovation Research, Small Business Technology Transfer, and Established Program to Stimulate Competitive Research.

Data collection authority. The information is solicited under the authority of the National Science Foundation Act of 1950, as amended, and the America COMPETES Reauthorization Act of 2010.

Survey contractor. Synectics for Management Decisions, Inc. (Synectics)

Survey sponsor. The National Center for Science and Engineering Statistics (NCSES) within the National Science Foundation (NSF).

Key Survey Information

Frequency. Annual.

Initial survey year. 1951.

Reference period. FYs 2016–17.

Response unit. Federal agencies.

Sample or census. Census.

Population size. In the survey cycle for data collection on FYs 2016–17, a total of 29 federal agencies reported R&D data. (See "Survey Design" for details.)

Sample size. Not applicable; the survey is a census of all federal agencies that conduct R&D programs, excluding the Central Intelligence Agency (CIA).

Survey Design

Target population. The Federal Funds Survey target population consists of the federal agencies that conduct R&D programs, excluding the CIA. For the FYs 2016–17 cycle, 29 federal agencies (15 federal departments and 14 independent agencies) reported R&D data. Because multiple subdivisions of some federal departments completed the survey, there were 75 agency-level respondents: 5 federal departments, 56 agencies within another 10 federal departments, and 14 independent agencies. However, lower offices could also be authorized to enter data: agency-level offices could authorize program

offices, program offices could authorize field offices, and field offices could authorize branch offices. When these sub-offices are included, there were 710 total respondents: 75 agencies, 194 program offices, 183 field offices, and 258 branch offices.

Frame. The survey is a census of all federal agencies that conduct R&D programs, which are identified from information in the president's budget submitted to Congress. The Analytical Perspectives volume and the "Detailed Budget Estimates by Agency" section of the appendix to the president's budget identify agencies that receive R&D funding. In addition, the U.S. Government Manual is consulted.

Sample design. Not applicable.

Data Collection and Processing Methods

Data collection. Data for FYs 2016–17 (volume 66) were collected by Synectics under contract to NCSES. Data collection began with an e-mail to each agency to verify the name, address, fax and phone numbers, and e-mail address of each agency-level survey respondent. A Web-based data collection system is used to collect the Federal Funds Survey data.

The Web-based data collection system is part of NCSES's effort to enhance survey reporting and reduce data collection and processing costs by offering respondents direct online reporting and editing. However, some agencies submit their data in alternative formats.

For volume 66, information was collected for 2 instead of 3 federal government fiscal years: the fiscal year just completed (FY 2016) and the current fiscal year (FY 2017). The president's budget year (FY 2018) was not included due to the delayed FY 2018 budget formulation process. FY 2016 data are completed transactions. FY 2017 data are estimates of congressional appropriation actions and apportionment and reprogramming decisions.

Data collection was conducted in two phases for volume 66: for non-Department of Defense (non-DOD) agencies, it began 30 May 2017, and the requested due date for data submissions was 28 July 2017; for DOD agencies, it began 24 July 2017, and the requested due date for data submissions was 29 September 2017. Data collection was extended until all of the surveyed agencies provided complete and final survey data.

Mode. The Federal Funds Survey uses a Web-based data collection system. The Web-based system consists of a data collection component that allows survey respondents to enter their data online and a monitoring component that allows the data collection contractor to monitor support requests, data entry, and data issues. The Web-based system's two components are password protected, so that only authorized respondents and staff can access them. All data imports and trend checking are accomplished using the Web-based system.

Response rate. 100%.

Data checking. Data errors in the Federal Funds Survey are flagged automatically by the Web-based data collection system: respondents cannot submit their data to NCSES until all required fields have been completed without errors. Once data are submitted, each agency's narrative statement, 2-year difference report, and $100-million difference report are reviewed. Respondents are contacted to resolve potential reporting errors that cannot be reconciled by the narratives. Explanations of questionable data are noted.

Imputation. None.

Weighting. None.

Variance estimation. Not applicable.

Survey Quality Measures

Sampling error. Not applicable.

Coverage error. Given the existence of a complete list of all eligible agencies, there is no known coverage error. The CIA is purposefully excluded.

Nonresponse error. Agencies are encouraged to estimate when actual data are unavailable. The survey instrument allows respondents to enter data or skip data fields. NCSES assumes a blank field is zero for estimation purposes. There are several possible causes for nonresponse error: data items incorrectly skipped by respondents; an incorrect assumption that zeros indicate blank fields; and incorrect estimates when data are unavailable. If a significant number of blank fields are incorrectly skipped by respondents, nonresponse bias could result.

Measurement error. Some measurement problems are known to exist in the Federal Funds Survey data. Some agencies cannot report the full costs of R&D, the ultimate performer of R&D, or R&D plant data.

For example, the DOD does not include headquarters costs of planning and administering R&D programs, which are estimated at a fraction of 1% of its total cost. DOD has stated that identification of amounts at this level is impracticable.

The National Institutes of Health (NIH) in the Department of Health and Human Services currently has many of its awards in its financial system without any field of science code. Therefore, NIH uses an alternate source to estimate its research dollars by field of science. NIH uses scientific class codes (based upon past history of grant, content of the title, and the name of the awarding institute or center) as an approximation for field of science codes.

The National Aeronautics and Space Administration (NASA) does not include any field of science codes in its financial database. Consequently, NASA must estimate what percentage of the agency's research dollars are allocated into the fields of science.

The FY 2014 data reported by the Department of State were excluded due to their poor quality. Between FYs 2008 and 2013, the Department of State reported average annual obligations of $2.9 million for R&D and R&D plant out of average annual federal obligations of $138.1 billion over that same period.

Also, agencies are required to report the ultimate performer of R&D. However, through past workshops, NCSES has learned that some agencies do not always track their R&D dollars to the ultimate performer of R&D. This leads to some degree of misclassification of performers of R&D, but NCSES has not determined the extent of the errors in performer misclassification by the reporting agencies.

Eleven agencies are required to report R&D obligations by state and performer (the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Homeland Security, the Interior, and Transportation; the Environmental Protection Agency; NASA; and NSF). Obligations of these 11 agencies represent the vast majority of total federal R&D obligations (over 98% for FYs 2008–16), but there is some underreporting by state, and it may affect states unevenly. In addition, geographic distribution of DOD development funding to industry reflects the location of prime contractors and not the numerous subcontractors who perform much of the R&D. DOD development funding to industry

represented 42.0% of total federal obligations for development in FY 2016 ($20.3 billion out of $48.3 billion).

R&D plant data are underreported to some extent because of the difficulty some agencies, particularly DOD and NASA, encounter in identifying and reporting these data. DOD's respondents report obligations for R&D plant funded under the agency's appropriation for construction, but they are able to identify only a small portion of the R&D plant support that is within R&D contracts funded from DOD's appropriation for research, development, testing, and evaluation. Similarly, NASA respondents cannot separately identify the portions of industrial R&D contracts that apply to R&D plant, since these data are subsumed in the R&D data covering industrial performance. NASA R&D plant data for other performing sectors are reported separately.

Data Comparability (Changes)

Data revisions. When completing the current year's survey, agencies naturally revise their estimates for the latest 2 years of the previous report—in this case, FYs 2016 and 2017. Sometimes, survey submissions also reflect reappraisals and revisions in classification of various aspects of agencies' R&D programs; in those instances, NCSES requests that agencies provide revised prior-year data to maintain consistency and comparability with the most recent R&D concepts.

For trend comparisons, use the historical data from only the most recent publication, which incorporates changes agencies have made in prior-year data to reflect program reclassifications or other corrections. Do not use data published earlier.

Changes in survey coverage and population. This cycle (volume 66, FYs 2016–17), the Administrative Office of the U.S. Courts was added as a respondent because it sponsors a federally funded research and development center (FFRDC).

Changes in questionnaire.

- In volume 66, the survey table numbering was changed from Roman numerals I–XI and, for selected agencies, the letters A–E, to Arabic numerals 1–16. The order of tables remained the same. Due to the delayed FY 2018 budget formulation process, data were collected for only 2 fiscal years—FYs 2016 and 2017—instead of 3. Therefore, questions relating to FY 2018 were made inoperable.

- In the volume 66 DOD-version of the questionnaire, the definition of major systems development was changed to represent DOD Budget Activities 4 through 6 instead of Budget Activities 4 through 7, and questions relating to funding for Operational Systems Development (Budget Activity 7) were added to the instrument. The Table 6 and 11 narrative tables were removed from the DOD-version of the questionnaire.

- In volumes 59 (FYs 2009–11) and 60 (FYs 2010–12), questions relating to funding from the American Recovery and Reinvestment Act of 2009 (ARRA) were added to the data collection instruments. The survey collected separate outlays and obligations for ARRA and non-ARRA sources of funding, by performer and geography for FYs 2009 and 2010.

- Starting with volume 59 (FYs 2009–11), federal funding data were requested in actual dollars (instead of rounded in thousands, as was done through volume 58).

Changes in reporting procedures or classification.

- Beginning with FY 2016, the totals reported for development obligations and outlays represent a refinement to this category by more narrowly defining it to be "experimental development." Most notably, totals for development do not include DOD Budget Activity 7 (Operational System Development) obligations and outlays. Those funds, previously included in DOD's development totals, support the development efforts to upgrade systems that have been fielded or have received approval for full rate production and anticipate production funding in the current or subsequent fiscal year. Therefore, the data are not directly comparable with totals reported in previous years.

- Prior to the volume 66 launch, the definitions of basic research, applied research, experimental development, R&D, and R&D plant were revised to match the definitions used by the Office of Management and Budget in the July 2016 version of Circular A-11.

- In FY 2013, NASA revamped their reporting process so that the data for FY 2012 forward are not directly comparable with totals reported in previous years.

- Starting with volume 62 (FYs 2012–14), an "undistributed" category was added to the geographic location tables to include DOD obligations for intramural and industry R&D where the location of performance could not be identified. This change was applied retroactively to FY 2011 data.

- Starting with volume 61 (FYs 2011–13), DOD subagencies other than the Defense Advanced Research Projects Agency were reported as an aggregate total under other defense agencies to enable complete reporting of DOD R&D (both unclassified and classified). Consequently, DOD began reporting additional classified R&D not previously reported by its subagencies.

- FYs 2005–07. Before the volume 55 survey cycle, NSF updated the list of foreign performers in the Federal Funds Survey to match the list of countries and territories in the Department of State's Bureau of Intelligence and Research fact sheet of Independent States in the World and fact sheet of Dependencies and Areas of Special Sovereignty. Area and country lists in volume 55 data tables and later may differ from those in previous reports.

- November 2002. On 25 November, President Bush signed the Homeland Security Act of 2002, establishing the Department of Homeland Security.

- FYs 1996–98. The lines on the survey instrument for the special foreign currency program and for detailed field of science and engineering (S&E) were eliminated beginning with the volume 46 survey cycle. Two tables depicting data on foreign performers by region, country, and agency that were removed before publication of volume 43 (FYs 1993–95) were reinstated with volume 46.

- FYs 1994–96. During the volume 44 survey cycle, the Director for Defense Research and Engineering (DDR&E) at DOD requested that NSF further clarify the true character of DOD's R&D program, particularly as it compares with other federal agencies, by adding more detail to development obligations reported by DOD respondents. Specifically, DOD requested that NSF allow DOD agencies to report development obligations in two separate categories: advanced technology development and major systems development.

An excerpt from a letter written by Robert V. Tuohy, Chief, Program Analysis and Integration at DDR&E, to John E. Jankowski, Program Director, Research and Development Statistics Program, Division of Science Resources Statistics, NSF, explains the reasoning behind the DDR&E request:

The DOD's R&D program is divided into two major pieces, Science and Technology (S&T) and Major Systems Development. The other federal agencies' entire R&D programs are equivalent in nature to DOD's S&T program, with the exception of the Department of Energy and possibly NASA. Comparing those other agency programs to DOD's program, including the development of weapons systems such as F-22 Fighter and the New Attack Submarine, is misleading.

- FYs 1990–92. Since volume 40, DOD has reported research obligations and development obligations separately. Tables reporting obligations for research, by state and performer, and obligations for development, by state and performer, were specifically created for DOD. Circumstances specific to DOD are (1) DOD funds the preponderance of federal development and (2) DOD development funded at institutions of higher education is typically performed at university-affiliated nonacademic laboratories, which are separate from universities' academic departments, where university research is typically performed.

Changes in reporting.

- FY 2016. The Administrative Office of the U.S. Courts began reporting in FY 2016.

- FY 2015. The Administration for Community Living (ACL) began reporting in FY 2015, replacing the Administration on Aging, which was transferred to ACL when ACL was established on 18 April 2012. Several programs that serve older adults and people with disabilities were transferred from other agencies to ACL, including a number of programs from the Department of Education due to the 2014 Workforce Innovation and Opportunities Act.

- FY 2015. Two Department of the Interior agencies, the Bureau of Land Management and the U.S. Fish and Wildlife Service, which did not report data between FY 1999 and FY 2014, resumed reporting.

- FY 2014. In January 2014, all Research and Innovative Technology Administration programs were transferred into the Office of the Assistant Secretary for Research and Technology in the Office of the Secretary of Transportation.

- FY 2014. The Department of Homeland Security's Domestic Nuclear Detection Office began reporting.

- FY 2014. The Department of State's data were excluded due to their poor quality.

- FY 2013. NASA revamped their reporting process so that the data for FY 2012 forward are not directly comparable with totals reported in previous years.

- FY 2012. NASA began reporting International Space Station obligations as research rather than R&D plant.

- FYs 2011–13. To enable complete reporting of R&D (both unclassified and classified) from DOD, DOD subagencies other than the Defense Advanced Research Projects Agency are reported as an aggregate total under other defense agencies. Consequently, DOD began reporting additional classified R&D not previously reported by its subagencies.

- FY 2011. The Department of Agriculture's Economic Research Service revised its data for FY 2009.

- FY 2010. NASA resumed reporting International Space Station obligations as R&D plant.

- FYs 2000–09. Beginning in FY 2000, Air Force (AF) did not report Budget Activity 6.7 Operational Systems Development data because the agency misunderstood the reporting requirements. During the volume 57 data collection cycle (FYs 2007–09), AF edited prior-year data for FYs 2000–07 to include Budget Activity 6.7 Operational Systems Development data. These data revisions were derived from FY 2007 distribution percentages that were then applied backward to revise data for FYs 2000–06.

- FY 2007. NASA's R&D obligations decreased by $1 billion between FYs 2006 and 2007. Of this amount, $850 million was accounted for by obligations for operational projects that NASA excluded in FY 2007 but reported in FY 2006. The remainder was from an overall decrease in obligations between FYs 2006 and 2007.

- FY 2006. NASA reclassified funding for the following items as operational costs: Space Operations, the Hubble Space Telescope, the Stratospheric Observatory for Infrared Astronomy, and the James Webb Space Telescope. This funding was previously reported as R&D plant.

- FYs 2004–06. NASA implemented a full-cost budget approach, which includes all of the direct and indirect costs for procurement, personnel, travel, and other infrastructure-related expenses relative to a particular program and project. NASA's data for FY 2004 and later years may not be directly comparable with its data for FY 2003 and earlier years.

- FY 2004. NIH revised its financial database. Beginning with FY 2004, NIH records no longer contain information on the field of S&E. Data for FY 2004 and later years are not directly comparable with data for FY 2003 and earlier years.

- FY 2003. The Substance Abuse and Mental Health Services Administration reclassified some of its funding categories as non-R&D that had been considered R&D in prior years.

- FY 2000. NASA reclassified the Space Station as a physical asset, reclassified Space Station Research as equipment, and transferred funding for the program from R&D to R&D plant. Also in FY 2000, NIH reclassified as research the activities that it had previously classified as development. For more information on the classification changes at NASA and NIH, refer to *Classification Revisions Reduce Reported Federal Development Obligations* (InfoBrief NSF 02-309), February 2002, available at http://www.nsf.gov/statistics/nsf02309/.

Definitions

Agency and subdivision. An agency is an organization of the federal government whose principal executive officer reports to the president. The Library of Congress and the Administrative Office of the

U.S. Courts are also included in the survey, even though the chief officer of the Library of Congress reports to Congress and the U.S. Courts are part of the judicial branch. Subdivision refers to any organizational unit of a reporting agency, such as a bureau, division, office, or service.

Development. See Research, development, and R&D plant.

Fields of science and engineering. The Federal Funds Survey uses eight broad field categories, each comprising a number of detailed fields. A discipline under one detailed field may be classified under another detailed field when the major emphasis is elsewhere. Research in biochemistry, for example, might be reported as biological, agricultural, or medical, depending on the focus of the project. No double counting is intended or allowed. The fields are as follows:

- *Computer sciences and mathematics* employs logical reasoning with the aid of symbols and is concerned with the development of methods of operation using such symbols or with the application of such methods to automated information systems. Detailed fields: computer sciences, mathematics, and other computer sciences and mathematics.

- *Engineering* is concerned with developing engineering principles or making specific principles usable in engineering practice. Detailed fields: aeronautical, astronautical, chemical, civil, electrical, mechanical, metallurgy and materials engineering, and other engineering.

- *Environmental sciences* (terrestrial and extraterrestrial) is, with the exception of oceanography, concerned with the gross nonbiological properties of the areas of the solar system that directly or indirectly affect human survival and welfare. Obligations for studies pertaining to life in the sea or other bodies of water are reported as support of oceanography, not biology. Detailed fields: atmospheric sciences, geological sciences, oceanography, and other environmental sciences.

- *Life sciences* is concerned with the scientific study of living organisms and their systems. Detailed fields: agricultural sciences, biological sciences (excluding environmental biology), environmental biology, medical sciences, and other life sciences.

- *Physical sciences* is concerned with understanding of the material universe and its phenomena. Detailed fields: astronomy, chemistry, physics, and other physical sciences.

- *Psychology* deals with behavior, mental processes, and individual and group characteristics and abilities. Detailed fields: biological aspects, social aspects, and other psychological sciences.

- *Social sciences* is concerned with an understanding of the behavior of social institutions and groups and of individuals as members of a group. Detailed fields: anthropology, economics, political science, sociology, and other social sciences.

- *Other sciences not elsewhere classified (nec)* is used for multidisciplinary or interdisciplinary projects that cannot be classified within one of the broad fields of science already listed.

Federal obligations for research performed at universities and colleges, by detailed field of science. Seven agencies respond to this part of the survey: the Departments of Agriculture, Defense, Energy, Health and Human Services, and Homeland Security; NASA; and NSF.

Geographic distribution of R&D obligations. The 11 largest R&D funding agencies respond to this portion of the survey: the Departments of Agriculture, Commerce, Defense, Energy, Health and Human Services, Homeland Security, the Interior, and Transportation; the Environmental Protection Agency; NASA; and NSF. They are asked to provide the principal location (state or outlying area) of the work performed by the primary contractor, grantee, or intramural organization, assign the obligations to the location of the headquarters of the U.S. primary contractor, grantee, or intramural organization, or list the funds as undistributed.

Obligations and outlays. Obligations represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when funds were appropriated and when future payment of money is required. Outlays represent the amounts for checks issued and cash payments made during a given period, regardless of when funds were appropriated.

Performer. An intramural group or organization carrying out an operational function or an extramural organization or a person receiving support or providing services under a contract or grant.

- *Intramural performers* are the agencies of the federal government. The work of these agencies is carried out directly by agency personnel. Obligations reported under this category are for activities performed or to be performed by the reporting agency itself or are for funds that the agency transfers to another federal agency for performance of work, as long as the ultimate performer is that agency or any federal agency. If the ultimate performer is not a federal agency, funds transferred are reported by the transferring agency under the appropriate extramural performer category (businesses, universities and colleges, other nonprofit institutions, FFRDCs, nonfederal government, and foreign).

Intramural activities cover not only actual intramural R&D performance but also the costs associated with administration of intramural R&D programs and extramural R&D procurements by federal personnel. Intramural activities also include the costs of supplies and off-the-shelf equipment (equipment that has gone beyond the development or prototype stage) procured for use in intramural R&D. For example, an operational launch vehicle purchased from an extramural source by NASA and used for intramural performance of R&D is reported as a part of the cost of intramural R&D.

- *Extramural performers* are organizations outside the federal sector that perform R&D with federal funds under contract, grant, or cooperative agreement. Only costs associated with actual R&D performance are reported. Types of extramural performers:

  Businesses or industrial firms—organizations that may legally distribute net earnings to individuals or to other organizations.

  Universities and colleges—Institutions of higher education in the United States that engage primarily in providing resident or accredited instruction for a not less than a 2-year program above the secondary school level that is acceptable for full credit toward a bachelor's degree or that provide not less than a 1-year program of training above the secondary school level that prepares students for gainful employment in a recognized occupation. Included are colleges of liberal arts; schools of arts and sciences; professional schools, as in engineering and medicine, including affiliated hospitals and associated research institutes; and agricultural experiment stations. Other examples of universities and colleges include community colleges, 4-year colleges, universities, and freestanding professional schools (medical schools, law schools, etc.).

Other nonprofit institutions—Private organizations other than educational institutions whose net earnings do not benefit either private stockholders or individuals and other private organizations organized for the exclusive purpose of turning over their entire net earnings to such nonprofit organizations. Examples of nonprofit institutions include foundations, trade associations, charities, and research organizations.

Federally funded research and development centers (FFRDCs)—R&D-performing organizations that are exclusively or substantially financed by the federal government and are supported by the federal government either to meet a particular R&D objective or in some instances to provide major facilities at universities for research and associated training purposes. Each center is administered by an industrial firm, a university, or another nonprofit institution (see http://www.nsf.gov/statistics/ffrdclist/ for the Master List of FFRDCs maintained by NSF).

State and local governments—State and local government agencies, excluding state or local universities and colleges, agricultural experiment stations, medical schools, and affiliated hospitals. (Federal R&D funds obligated directly to such state and local institutions are excluded in this category. However, they are included under the universities and colleges category in this report.) R&D activities under the state and local governments category are performed either by the state or local agencies themselves or by other organizations under grants or contracts from such agencies. Regardless of the ultimate performer, federal R&D funds directed to state and local governments are reported only under this sector.

Foreign performers—Foreign citizens, foreign organizations, or foreign governments, as well as international organizations (such as the North Atlantic Treaty Organization; the United Nations Educational, Scientific, and Cultural Organization; and the World Health Organization), performing R&D work abroad financed by the federal government. Excluded from the survey are U.S. agencies, organizations, or citizens performing R&D abroad for the federal government. An exception in the past was made in the case of U.S. citizens performing R&D abroad under special foreign-currency funds; these activities were included under the foreign performers category but have not been collected since the mid-1990s.

Private individuals—When an R&D grant or contract is awarded directly to a private individual, obligations incurred are placed under the category industrial firms.

Research, development, and R&D plant. Amounts for R&D and R&D plant include all direct, incidental, or related costs resulting from, or necessary to, performance of R&D and costs of R&D plant as defined below, regardless of whether R&D is performed by a federal agency (intramurally) or by private individuals and organizations under grant or contract (extramurally). R&D excludes routine product testing, quality control, mapping and surveys, collection of general-purpose statistics, experimental production, and the training of scientific personnel.

- *Research* is defined as systematic study directed toward fuller scientific knowledge or understanding of the subject studied. Research is classified as either basic or applied, according to the objectives of the sponsoring agency.

  Basic research is defined as experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts. Basic research may include activities with broad or general applications in mind, such as the study

of how plant genomes change, but should exclude research directed toward a specific application or requirement, such as the optimization of the genome of a specific crop species.

Applied research is defined as original investigation undertaken in order to acquire new knowledge. Applied research is, however, directed primarily toward a specific practical aim or objective.

- *Development,* also known as experimental development, is defined as creative and systematic work, drawing on knowledge gained from research and practical experience, which is directed at producing new products or processes or improving existing products or processes. Like research, experimental development will result in gaining additional knowledge.

For reporting experimental development activities, the following are included:

  - The production of materials, devices, and systems or methods, including the design, construction, and testing of experimental prototypes.

  - Technology demonstrations, in cases where a system or component is being demonstrated at scale for the first time and it is realistic to expect additional refinements to the design (feedback R&D) following the demonstration. However, not all activities that are identified as "technology demonstrations" are R&D.

However, experimental development excludes

  - User demonstrations where the cost and benefits of a system are being validated for a specific use case. This includes low-rate initial production activities.

  - Pre-production development, which is defined as non-experimental work on a product or system before it goes into full production, including activities such as tooling and development of production facilities.

To better differentiate between the part of the federal R&D budget that supports science and key enabling technologies (including technologies for military and nondefense applications) and the part that primarily supports testing and evaluation (mostly of defense-related systems), NSF collects development dollars from DOD in two categories: advanced technology development and major systems development.

DOD uses research, development, test, and evaluation (RDT&E) Budget Activities 1–7 to classify data into the survey categories. Within DOD's research categories, basic research is classified as Budget Activity 1, and applied research is classified as Budget Activity 2. Within DOD's development categories, advanced technology development is classified as Budget Activity 3. Starting in volume 66, major systems development is classified as Budget Activities 4–6 instead of Budget Activities 4–7 and includes component developmental prototypes and demonstration and development of management support. In volume 66, Budget Activity 7, operational systems development, was collected separately. NOTE: As a historical artifact from previous DOD budget authority terminology, funds for Budget Activity categories 1 through 7 are sometimes referred to as 6.1 through 6.7 monies.

- *Demonstration* includes amounts for activities that are part of R&D (i.e., that are intended to prove or to test whether a technology or method does in fact work). Demonstrations intended primarily to make information available about new technologies or methods are excluded.

- *R&D plant* is defined as spending on both R&D facilities and major equipment as defined in Office of Management and Budget (OMB) Circular A-11 Section 84 (Schedule C) and includes physical assets, such as land, structures, equipment, and intellectual property (e.g., software or applications) that have an estimated useful life of 2 years or more. Reporting for R&D plant includes the purchase, construction, manufacture, rehabilitation, or major improvement of physical assets regardless of whether the assets are owned or operated by the federal government, states, municipalities, or private individuals. The cost of the asset includes both its purchase price and all other costs incurred to bring it to a form and location suitable for use.

For reporting construction of R&D facilities and major moveable R&D equipment, include the following:

  - Construction of facilities that are necessary for the execution of an R&D program. This may include land, major fixed equipment, and supporting infrastructure such as a sewer line, or housing at a remote location. Many laboratory buildings will include a mixture of R&D facilities and office space. The fraction of the building that is considered to be R&D may be calculated based on the percentage of square footage that is used for R&D.

  - Acquisition, design, or production of major moveable equipment, such as mass spectrometers, research vessels, DNA sequencers, and other moveable major instrumentation for use in R&D activities.

  - Programs of $1 million or more that are devoted to the purchase or construction of R&D major equipment.

Exclude the following:

  - Construction of other non-R&D facilities

  - Minor equipment purchases, such as personal computers, standard microscopes, and simple spectrometers (report these costs under total R&D, not R&D Plant)

  - Obligations for foreign R&D plant are limited to federal funds for facilities that are located abroad and used in support of foreign R&D.