



441 G St. N.W.
Washington, DC 20548

April 8, 2016

The Honorable John McCain
Chairman
The Honorable Jack Reed
Ranking Member
Committee on Armed Services
United States Senate

The Honorable Mac Thornberry
Chairman
The Honorable Adam Smith
Ranking Member
Committee on Armed Services
House of Representatives

Federal Research: Information on DOE's Laboratory-Directed Research and Development Program

The Department of Energy's (DOE) contractor-operated laboratories perform mission-related research and development (R&D) for DOE, other federal agencies, and nonfederal organizations. In fiscal year 2015, these laboratories spent more than \$13 billion on R&D and related operating expenses that supported DOE's national nuclear security, energy resources, environmental management, and science programs. To foster scientific excellence at these laboratories, DOE laboratories use a portion of laboratory funds to conduct self-initiated R&D projects selected at the discretion of the laboratory directors. The National Defense Authorization Act for Fiscal Year 1991 explicitly authorized the contractor-operated laboratories that receive funding for national security programs to use a percentage of laboratory funds to perform laboratory-directed R&D of a creative and innovative nature to maintain the vitality of the laboratories' defense-related scientific disciplines.

In 1992, DOE formalized its laboratories' self-initiated R&D programs by establishing the Laboratory-Directed Research and Development (LDRD) program, under which directors of contractor-operated laboratories may allocate funding to scientists to conduct worthy independent research. The laboratories fund their LDRD programs by including a charge, up to statutory limits, in their indirect cost of doing R&D work for DOE, other federal agencies, and nonfederal organizations. Total funding for LDRD programs at the DOE laboratories was \$542 million in fiscal year 2015—about 4.2 percent of the laboratories' total operating and capital equipment budgets.

The Joint Explanatory Statement of the Committee of Conference accompanying the National Defense Authorization Act for Fiscal Year 2016 included a provision for GAO to assess the National Nuclear Security Administration's (NNSA) LDRD program funding limits and personnel

levels.¹ Our objectives were to examine (1) funding limits on NNSA's LDRD program compared to limits on similar programs at other DOE and Department of Defense (DOD) laboratories and (2) the number of personnel supported by LDRD funding at NNSA laboratories, including the number supported by LDRD for the majority of their time. On April 8, 2016, we briefed your staffs on the results of our review. This report formally transmits the information provided at that briefing.

To address our objectives, we reviewed the LDRD programs at NNSA's three national security laboratories—Lawrence Livermore, Los Alamos, and Sandia—as well as at the other DOE laboratories. In addition, we reviewed two R&D programs at DOD laboratories: (1) the funding for R&D authorized under Section 219 of the Duncan Hunter National Defense Authorization Act for Fiscal Year 2009, as amended, referred to as the Section 219 program,² and (2) the In-House Laboratory Independent Research (ILIR) program. These programs support research at DOD-operated laboratories and are similar to DOE's LDRD program in that they allow laboratory directors to select and fund R&D projects.

To determine the NNSA LDRD funding limits and compare them to limits at other DOE and DOD laboratories, we reviewed LDRD funding limits, including recent legislative changes affecting the LDRD program, and the DOE order governing the program. We reviewed DOE's LDRD report to Congress for fiscal year 2015 and the three NNSA laboratories' LDRD plans for fiscal year 2015. We interviewed NNSA and DOE officials to determine how NNSA applies the funding limits at its three national laboratories and to compare NNSA's practices with those at DOE's other laboratories. To gain further insight into these practices, we interviewed laboratory officials at the Sandia and Pacific Northwest National Laboratories (the NNSA and DOE laboratories, respectively, with the largest LDRD programs in fiscal year 2015). We reviewed the law authorizing the Section 219 program, the DOD instruction governing the ILIR program, and DOD annual reports on the Section 219 and ILIR programs. We also interviewed officials at DOD headquarters and two Army research laboratories that have the largest Section 219 and ILIR programs in that service to determine how they apply limits to their programs.

To examine the number of personnel supported by LDRD funding at NNSA laboratories, we obtained personnel data for fiscal years 2012 through 2015 from the laboratories. We analyzed the data to determine the number of personnel who were supported by LDRD funding for the majority (i.e., more than 50 percent) of their time in fiscal year 2015 and the number who also were supported for the majority of their time for the 3 years from fiscal years 2012 through 2014. We further analyzed the data to assess major categories of laboratory personnel. To determine the data's reliability and comparability, we tested the data for errors or inconsistencies and worked with the NNSA laboratories to resolve any issues. We also interviewed laboratory officials about the systems from which they obtained the data and the steps they took to produce the data. We determined that the data were sufficiently reliable for reporting on the number of NNSA laboratory personnel supported by LDRD funding.

We conducted this performance audit from January 2016 to April 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

¹H.R. Rep. No. 114-270, at 870 (2015).

²Pub. L. No. 110-417, as amended (10 U.S.C. 2358 note).

In summary, for fiscal year 2015, NNSA's authorized LDRD funding limit, expressed as a percentage, was the same as the LDRD funding limit for other DOE laboratories and higher than the funding limits for the two comparable DOD research programs we reviewed—the Section 219 and ILIR programs. DOE's LDRD policy directs NNSA and other DOE laboratories to comply with statutory limits—for fiscal year 2015, generally 6 percent of funds provided by DOE to the laboratories. The two comparable DOD research programs we examined had funding limits of 3 percent of laboratory funding, for the Section 219 program, and 2.5 percent of total basic research budgets for DOD's services, for the ILIR program.

On the basis of our analysis, NNSA's three laboratories employed a total of 28,143 personnel during fiscal year 2015. Of these,

- 4,556 (16.2 percent of the total) were supported by funding under the LDRD program for some amount of time—that is, an hour or more;
- 1,015 (3.6 percent of the total) were supported by funding under the LDRD program for a majority of their time—that is, 50 percent or more; and
- 167 (0.6 percent of the total) also were supported by funding under the LDRD for a majority of their time in fiscal years 2012 through 2014.

Agency Comments

We are not making recommendations in this report. We provided a draft of this report to DOE and DOD for comment. DOE provided technical comments, which we incorporated as appropriate, and DOD had no comments.

We are sending copies of this report to the appropriate congressional committees, the Secretaries of Energy and Defense, and other interested parties. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staffs have questions concerning this report, please contact me at (202) 512-3841 or neumannj@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Major contributors to this report were Joseph Cook (Assistant Director); Richard Burkard; Colleen Corcoran; Justin Fisher; Ellen Fried; Holly Hobbs; Terrance N. Horner, Jr.; and Armetha Liles.



John Neumann
Director, Natural Resources and Environment

Enclosure



Federal Research: Information on DOE's Laboratory-Directed Research and Development Program

Briefing for the Senate and House Armed Services Committees

April 8, 2016

- Introduction
- Objectives, Scope, and Methodology
- Summary
- **Objective 1:** Funding Limits on the Laboratory-Directed Research and Development (LDRD) Program at the Department of Energy (DOE) and Comparable Programs at the Department of Defense (DOD)
- **Objective 2:** National Nuclear Security Administration (NNSA) Personnel Supported by LDRD Funding

- DOE manages and funds research at its 17 national laboratories, including NNSA's three national security laboratories. Other federal agencies and nonfederal organizations may also fund research at the laboratories. Funding from non-DOE sources flows through DOE.
- Most of the research conducted at each laboratory is directed by DOE, as well as by other federal agencies and nonfederal organizations that provide the funding to the laboratory. Some of the research is directed by the laboratory under the LDRD program.
- Under DOE's LDRD program, directors at DOE's 16 contractor-operated laboratories may use a portion of the funding they receive from DOE to conduct laboratory-directed research.¹
- The LDRD program's objectives are to (1) maintain the scientific and technical vitality of the laboratories; (2) enhance the laboratories' ability to address current and future missions; (3) foster creativity and stimulate exploration of forefront areas of science and technology; (4) serve as a proving ground for new concepts in research and development; and (5) support high-risk, potentially high-value research and development.

¹Currently, 16 of 17 DOE laboratories are contractor-operated and are eligible for LDRD programs. As a government-owned, government-operated laboratory, DOE's National Energy Technology Laboratory is not eligible to have an LDRD program.

- DOD provides its government-operated laboratories with two programs for laboratory-initiated research: (1) Section 219 of the Duncan Hunter National Defense Authorization Act of Fiscal Year 2009 and (2) the In-House Laboratory Independent Research (ILIR) program.
- Generally, as described below, there are statutory limits on the use of funds for these programs. In the case of the DOD ILIR, the funding limit is set by DOD policy.

- The Joint Explanatory Statement of the Committee of Conference accompanying the National Defense Authorization Act for Fiscal Year 2016 included a provision for GAO to assess the NNSA LDRD program's funding limits and personnel levels.
- Specifically, we reviewed the following:
 1. funding limits on NNSA's LDRD program compared to limits on similar programs at other DOE and DOD laboratories, and
 2. the number of personnel supported by LDRD funding at NNSA laboratories and the number who are supported by LDRD funding for the majority (i.e., more than 50 percent) of their time.

To examine the funding limits on NNSA's LDRD program and compare them to limits on similar programs at other DOE and DOD laboratories, we

- reviewed LDRD funding limits in the law establishing the program, including changes over time, and in the DOE order governing the program;
- reviewed DOE's LDRD report to Congress for fiscal year 2015 and LDRD plans for fiscal year 2015 from the three NNSA laboratories—Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Sandia National Laboratories;
- interviewed NNSA and DOE officials to determine how NNSA applies the funding limits at the three NNSA national laboratories and to compare NNSA's practices with those at DOE's non-NNSA laboratories;
- interviewed NNSA, DOE, and laboratory officials at the NNSA and DOE laboratories with the largest amounts of LDRD funding in fiscal year 2015—Sandia National Laboratories and Pacific Northwest National Laboratory, respectively;
- reviewed the law establishing the Section 219 program, DOD's policy for the ILIR program, and DOD's annual reports for these programs for fiscal years 2012 through 2014; and
- interviewed DOD headquarters officials and officials at the two Army laboratories with the largest Section 219 and ILIR programs to determine how DOD applies funding limits on those programs.

To examine the number of personnel supported by LDRD funding at NNSA laboratories and the number who are supported by LDRD funding for the majority of their time, we

- obtained personnel data from NNSA's three laboratories for fiscal years 2012 through 2015;
- analyzed the number of personnel who were supported by LDRD funding for the majority of their time (i.e., more than 50 percent) in fiscal year 2015, including the number who also were supported for the majority of their time from fiscal year 2012 through fiscal year 2014;
- assessed major categories of laboratory personnel who were supported by LDRD funding; and
- interviewed agency and NNSA laboratory officials to determine the reliability and comparability of data across laboratories; tested the data for errors or inconsistencies and worked with the laboratories to resolve any issues; and interviewed officials regarding the steps they took to produce the data, including the systems from which they obtained the data.

We determined that the personnel data were sufficiently reliable for reporting on the number of NNSA laboratory personnel supported by LDRD funding.

Objectives, Scope, and Methodology

Scope and Methodology

- We conducted this performance audit from January 2016 to April 2016 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

- Funding limits on LDRD programs at NNSA laboratories were the same as LDRD limits at other DOE laboratories and higher than limits for comparable programs at DOD laboratories in fiscal year 2015. The limits are expressed as a percentage of funding available for research and development and were as follows for fiscal year 2015:
 - The limit on LDRD funding at NNSA laboratories was 6 percent of funds provided by DOE to the laboratories for national security activities.²
 - The limit on LDRD funding at other DOE laboratories was 6 percent of funds made available by DOE for activities at the laboratories.
 - The limit on Section 219 funding at DOD was 3 percent of all funds available to the defense laboratories.
 - The limit on ILIR funding at DOD was 2.5 percent of the basic research and development budget of each DOD service—Air Force, Army, and Navy.
- NNSA's three laboratories employed a total of 28,143 personnel during fiscal year 2015. Of these,
 - 4,556 (16.2 percent of the total) were supported by LDRD funding for some amount of time,
 - 1,015 (3.6 percent of the total) were supported by LDRD funding for a majority of their time, and
 - 167 (0.6 percent of the total) also were supported by LDRD funding for a majority of their time in fiscal years 2012 through 2014.

²As amended by section 3115 of the National Defense Authorization Act for Fiscal Year 2016, the relevant statute now reads: "Of the funds provided by the Department of Energy to a national security laboratory for national security activities, the Secretary shall provide a specific amount, of not less than 5 percent and not more than 7 percent of such funds, to be used by the laboratory for laboratory-directed research and development." 50 U.S.C. § 2791(c), as amended by Pub. L. No. 114-92, § 3115 (2015).

- Expressed as percentages, fiscal year 2015 funding limits on LDRD at NNSA were the same as limits for LDRD at other DOE laboratories and higher than limits for comparable programs at DOD laboratories. The LDRD programs' and Section 219 program's limits are established in law. The ILIR program's limits are established in DOD policy.
- DOE's LDRD funding limits have varied since the program began in 1991, ranging from 4 to 8 percent. The 2014 Appropriations Act imposed a 6 percent limit for LDRD at DOE laboratories. This restriction applies to funds made available by DOE for activities at laboratories in fiscal year 2014 and "any subsequent Energy and Water Development Appropriations Act for any fiscal year." DOD's funding limits on the Section 219 program have remained at 3 percent, while ILIR program funding has ranged from 5 percent in 1993 to its current level of 2.5 percent.

Table 1: Funding Limits on Laboratory-directed Research and Development Programs and Sources of the Limits for Fiscal Year 2015

Department	Program	Funding limit	Source of limit
DOE	NNSA LDRD programs	Not more than 6 percent of funds provided by DOE for national security activities	50 U.S.C. § 2791
	Other DOE LDRD programs	Not more than 6 percent of funds provided by DOE for activities at the laboratories	50 U.S.C. § 2791a; Pub. L. No. 113-76, div D, title III, § 309 (2014).
DOD	Section 219	Not more than 3 percent of all funds available to the defense laboratories	10 U.S.C. § 2358 note
	In-House Laboratory Independent Research	Not more than 2.5 percent of the total basic research budget of the DOD services ^a	DOD Instruction 3201.4

Legend: DOD = Department of Defense; DOE = Department of Energy; LDRD = Laboratory-Directed Research and Development; NNSA = National Nuclear Security Administration.

Source: GAO summary of information in law and policy. | GAO-16-486R

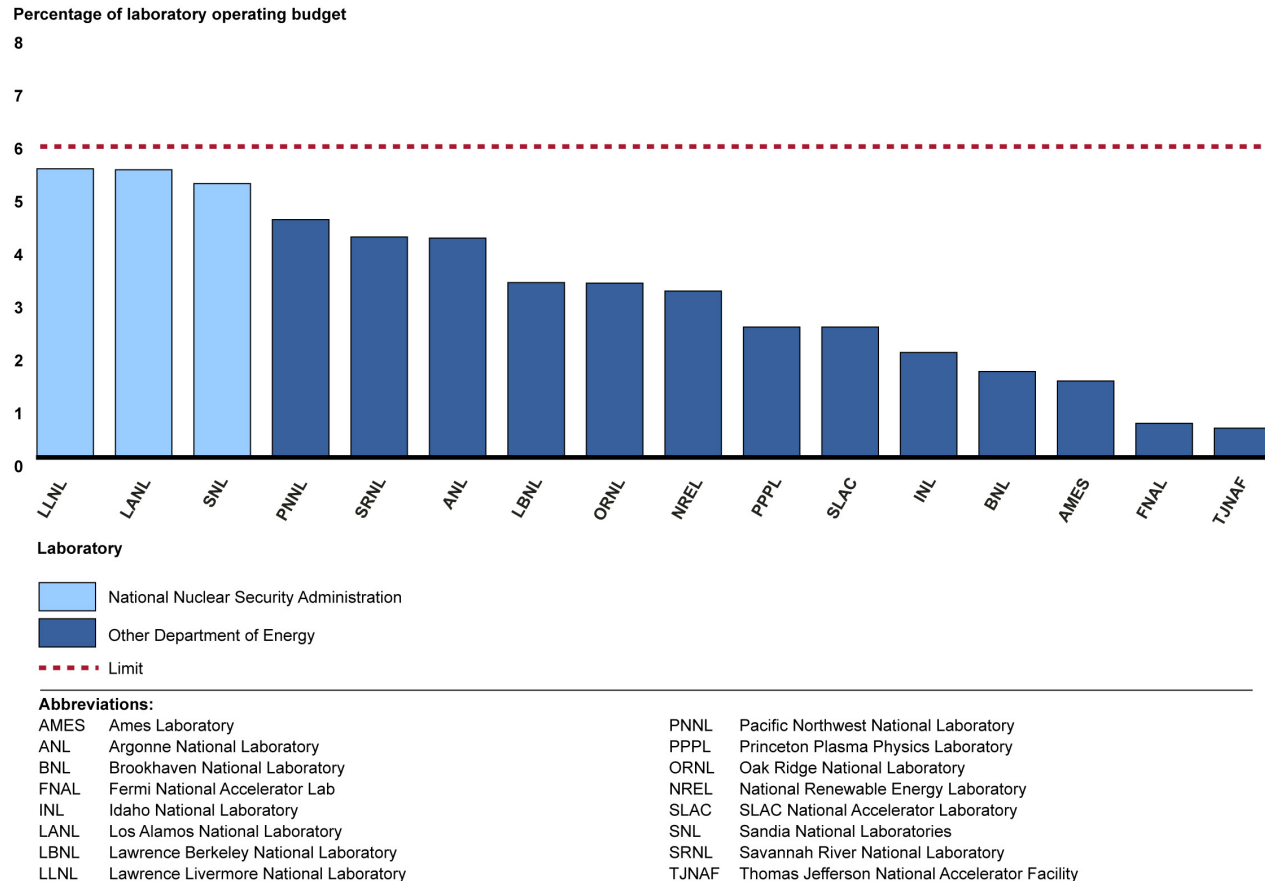
^aDOD's basic research programs are funded through the 6.1 budgets for the DOD services—Air Force, Army, and Navy.

Funding Limits

LDRD Programs Compared to Funding Limits

NNSA laboratories operate closer to the LDRD limit than do the other DOE laboratories. According to NNSA laboratory officials, they carefully track their use of LDRD funding to make sure they comply with the limit.

Figure 1: Size of Laboratory-Directed Research and Development (LDRD) Program in Fiscal Year 2015 by Department of Energy (DOE) Laboratory



Source: GAO analysis of DOE data. | GAO-16-486R

- NNSA laboratories: The NNSA laboratories request LDRD funding as a percentage of total operating costs as part of their annual plan, rather than as a specific dollar amount. Officials at Sandia National Laboratories, which has NNSA's largest LDRD program, told us that because they operate close to the funding limit, budgeting for LDRD as a percentage allows the laboratory to maximize funding without going over the limit.
- Other DOE laboratories: Non-NNSA laboratories currently request a maximum dollar amount for their LDRD programs as part of their annual plans.

Allowable Uses and Limitations on Research and Development Funding

Table 2: Allowable Uses and Limitations on Funding for Laboratory-Directed Research and Development

Program	Laboratory-Directed Research and Development (LDRD) program	Section 219 of the Duncan Hunter National Defense Authorization Act of Fiscal Year 2009 (Section 219)	In-House Laboratory Independent Research (ILIR) program
Allowable uses	<p>LDRD funding is allowed for research projects in the forefront areas of science and technology relevant to DOE and NNSA missions.</p> <p>Normally, LDRD projects will be relatively small and also will include one or more of the following characteristics:</p> <ul style="list-style-type: none"> advanced study of hypotheses, concepts, or innovative approaches to scientific or technical problems; experiments and analysis directed toward “proof of principle” or early determination of the utility of new scientific ideas, technical concepts, or devices; and conception and preliminary technical analyses of experimental facilities or devices. <p>LDRD projects’ costs must be incurred in the same fiscal year in which funds are collected.</p>	<p>Section 219 funding is allowed for</p> <ul style="list-style-type: none"> innovative basic and applied research that is conducted at the defense laboratories and supports military missions; development programs that support the transition of technologies developed by the defense laboratories into operational use; workforce development activities that improve the capacity of the defense laboratories to recruit and retain personnel with needed scientific and engineering expertise; and revitalization, recapitalization, or minor military construction of laboratory infrastructure. 	<p>ILIR funding is allowed for</p> <ul style="list-style-type: none"> basic research efforts in support of the laboratories’ mission and must enhance factors that contribute to recruitment and retention of outstanding scientists and engineers.
Limitations	<p>LDRD funding may not be used to</p> <ul style="list-style-type: none"> substitute for or increase funding for any tasks not under the LDRD program, support projects that require additional non-LDRD funds to complete, support construction beyond the preliminary design phase, or support general purpose capital expenditures. <p>LDRD projects are generally limited to a maximum of 36 months.</p>	<p>Funding for a Section 219 project may not accumulate for more than 5 years.</p>	<p>ILIR funding may not be used to</p> <ul style="list-style-type: none"> make up for deficiencies in other programs, support outside contracts, or purchase equipment unless such action is in direct support of active ILIR programs. <p>ILIR projects are limited to not more than 3 years.</p>

Source: GAO analysis of funding limits on LDRD (DOE Order 413.2C), Section 219 (10 U.S.C. § 2358 note), and ILIR (DOD Instruction 3201.4). | GAO-16-486R

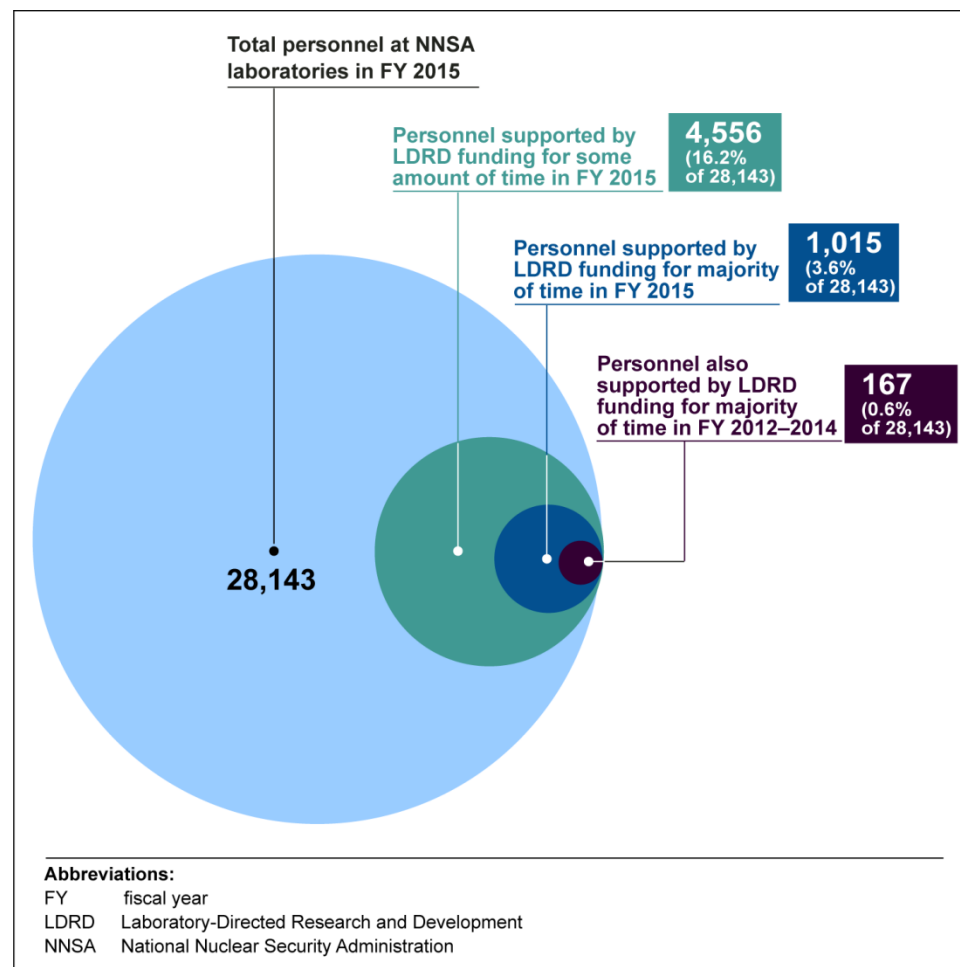
NNSA Laboratory Personnel Supported by LDRD Funding

Overview of Personnel Supported by LDRD Funding

Figure 2: Personnel at NNSA Laboratories Supported by LDRD Funding

NNSA's three laboratories employed a total of 28,143 personnel during fiscal year 2015. Of these,

- 4,556 were supported by LDRD funding for some amount of time—that is, an hour or more;
- 1,015 were supported by LDRD funding for a majority of their time—that is, 50 percent or more; and
- 167 also were supported by LDRD funding for a majority of their time in fiscal years 2012 through 2014.



Source: GAO analysis of NNSA laboratory data. | GAO-16-486R

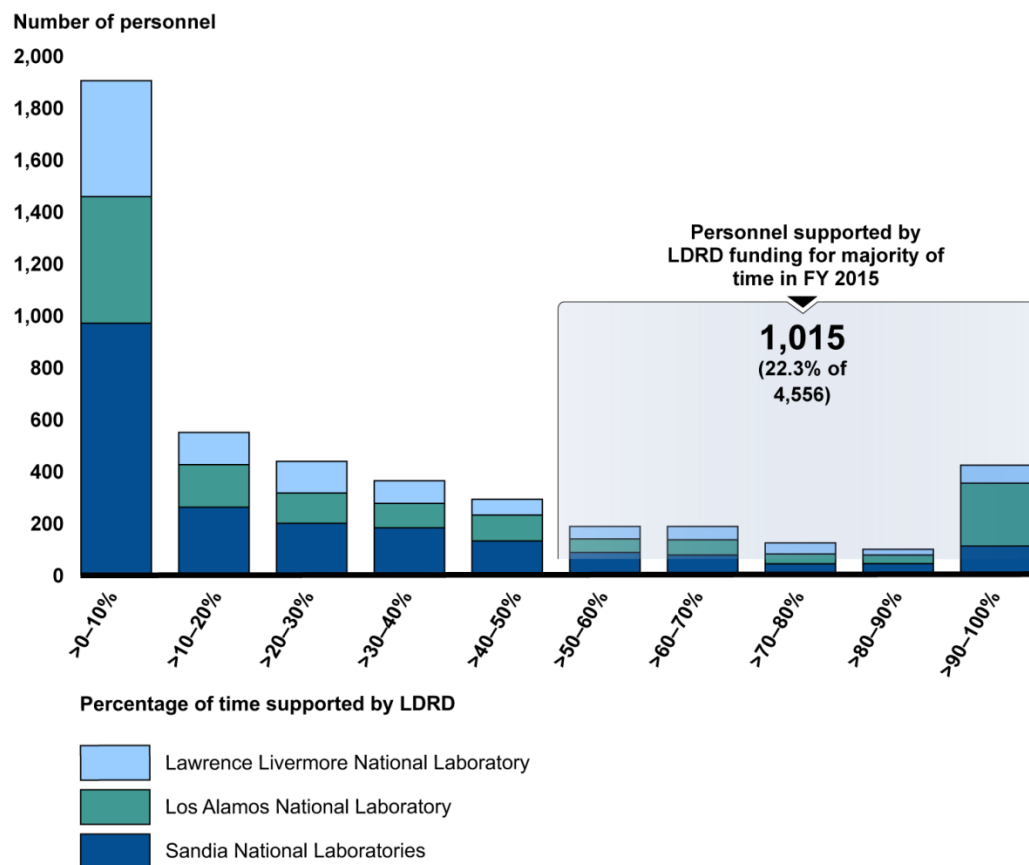
NNSA Laboratory Personnel Supported by LDRD Funding

Percentage of Time Supported by LDRD Funding

Based on our analysis, of the 4,556 personnel at NNSA laboratories that were supported by LDRD funding for some amount of time in fiscal year 2015,

- 1,015 (22.3 percent) were supported by LDRD funding for the majority of their time and
- 1,903 (41.8 percent) were supported by LDRD funding for 10 percent or less of their time.

Figure 3: NNSA Laboratory Personnel by Percentage of Time Supported by LDRD Funding in Fiscal Year 2015



Abbreviations:

FY fiscal year
LDRD Laboratory-Directed Research and Development
NNSA National Nuclear Security Administration

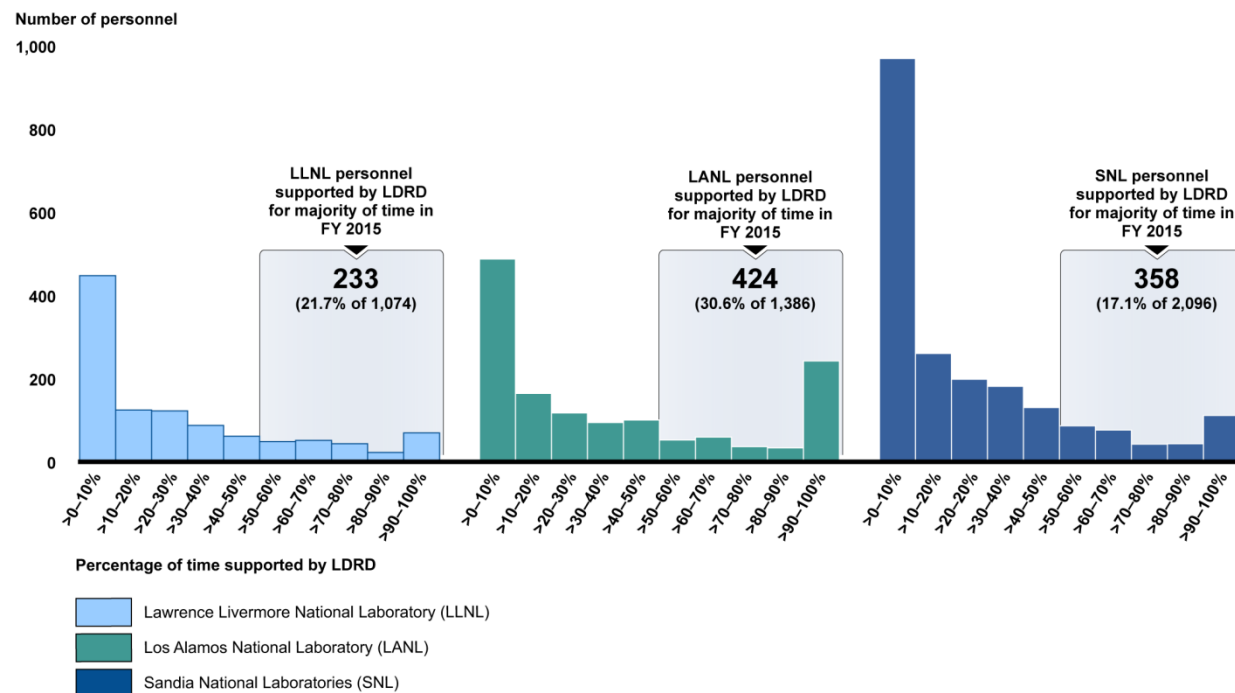
Source: GAO analysis of NNSA laboratory data. | GAO-16-486R

NNSA Laboratory Personnel Supported by LDRD Funding

Personnel Supported by LDRD Funding at Each Laboratory

Based on our analysis, the distribution of personnel by percentage of time supported by LDRD funding was similar across the three laboratories in fiscal year 2015, but the programs differ in size. Sandia had 2,096 personnel supported by LDRD funding—about twice as many as at Lawrence Livermore (1,074 personnel) or Los Alamos (1,386 personnel).

Figure 4: NNSA Laboratory Personnel by Percentage of Time Supported by LDRD Funding at Each Laboratory in Fiscal Year 2015



Abbreviations:

FY fiscal year
LDRD Laboratory-Directed Research and Development
NNSA National Nuclear Security Administration

Source: GAO analysis of DOE data. | GAO-16-486R

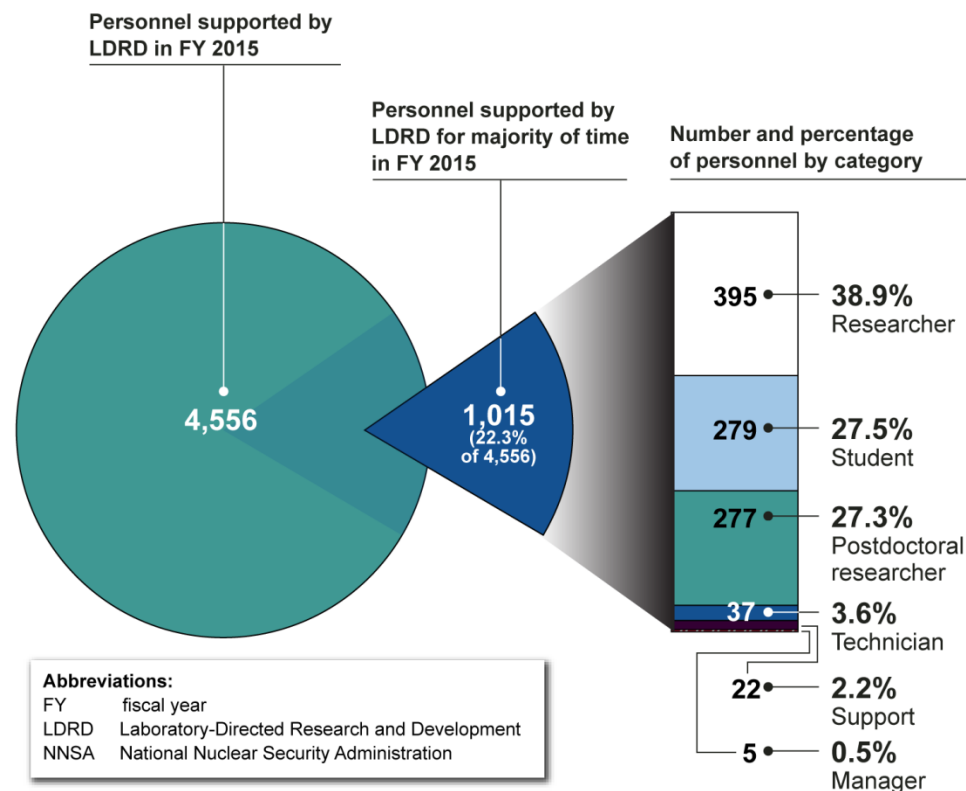
NNSA Laboratory Personnel Supported by LDRD Funding

Categories of Personnel Supported by LDRD Funding for Majority of Time

Based on our analysis, of the 4,556 personnel supported by LDRD for some amount of time in fiscal year 2015, 1,015 were supported by LDRD for a majority of their time. Of these 1,015,

- 38.9 percent were researchers, including scientists and engineers, and
- 54.8 percent were students (27.5 percent) or postdoctoral researchers (27.3 percent), positions that laboratories told us were part of their workforce pipeline for recruitment.

Figure 5: Categories of Personnel Supported by LDRD Funding for the Majority of Their Time in Fiscal Year 2015



Source: GAO analysis of NNSA laboratory data. | GAO-16-486R

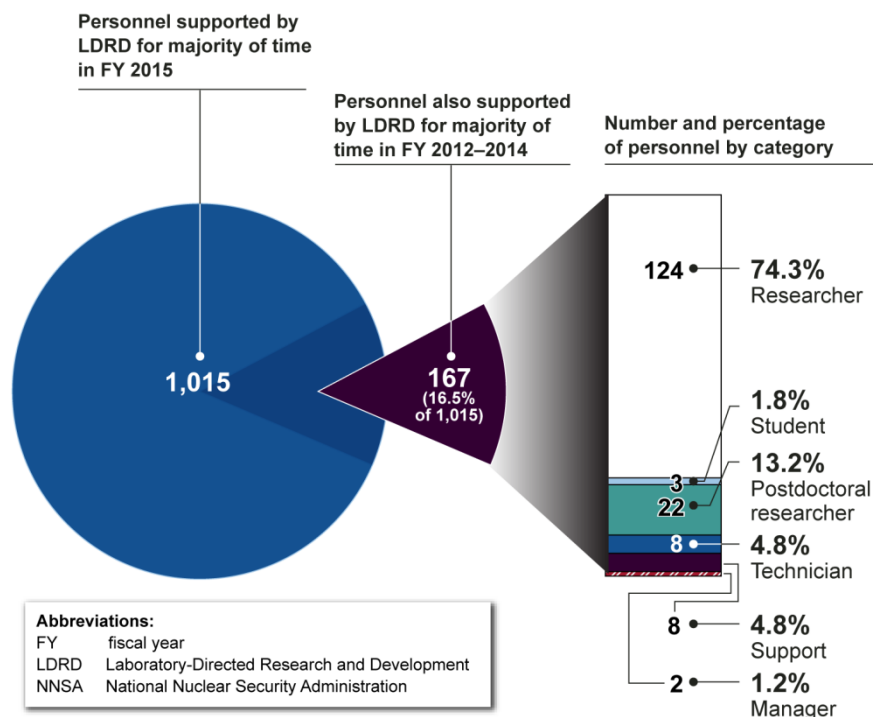
NNSA Laboratory Personnel Supported by LDRD Funding

Categories of Personnel Supported by LDRD for Majority of Time for More Than 3 Years

Based on our analysis, of the 1,015 personnel who were supported by LDRD for the majority of their time in fiscal year 2015, 167 also were supported for the majority of their time in fiscal years 2012 through 2014. Of the 167,

- almost three-quarters (74.3 percent) were researchers, including scientists and engineers, and
- 15 percent were students (1.8 percent) or postdoctoral researchers (13.2 percent), positions that laboratories told us were part of their workforce pipeline for recruitment.

Figure 6: Categories of Personnel Supported by LDRD Funding for the Majority of Their Time in Fiscal Year 2015 and 3 Previous Fiscal Years



Source: GAO analysis of NNSA laboratory data. | GAO-16-486R

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