U.S. DEPARTMENT OF ENERGY

Department of Energy Workforce Development and Readiness Programs, Fiscal Years 2011 to 2022

Report to Congress
May 2024

United States Department of Energy
Washington, DC 20585

Message from the Secretary

Pursuant to the requests in Committee Reports related to the fiscal year (FY) 2020 House Energy and Water Development and Related Agencies Appropriations Bill and the FY 2023 House Report for the Energy and Water Development and Related Agencies Appropriations Bill, the Senate explanatory statement for the Energy and Water Development Appropriations Bill, and the joint explanatory statement for the Energy and Water Development and Related Agencies Appropriations Act, the U.S. Department of Energy (DOE) prepared this report to provide an overview of the workforce development and readiness programs supported by DOE in FYs 2011–2022.

Pursuant to statutory requirements, this report is being provided to the following Members of Congress:

- **The Honorable Patty Murray**
  Chair, Senate Committee on Appropriations

- **The Honorable Susan Collins**
  Vice Chair, Senate Committee on Appropriations

- **The Honorable Tom Cole**
  Chairman, House Committee on Appropriations

- **The Honorable Rosa DeLauro**
  Ranking Member, House Committee on Appropriations

- **The Honorable Patty Murry**
  Chair, Subcommittee on Energy and Water Development
  Senate Committee on Appropriations

- **The Honorable John Kennedy**
  Ranking Member, Subcommittee on Energy and Water Development
  Senate Committee on Appropriations

- **The Honorable Chuck Fleischmann**
  Chairman, Subcommittee on Energy and Water Development, and Related Agencies
  House Committee on Appropriations

- **The Honorable Marcy Kaptur**
  Ranking Member, Subcommittee on Energy and Water Development, and Related Agencies
  House Committee on Appropriations

If you have any questions or need additional information, please contact me or Ms. Meg Roessing, Deputy Director for External Coordination, Office of Budget, Office of the Chief Financial Officer, at (202) 586-3128.

Sincerely,

Jennifer Granholm

Executive Summary

As requested by the fiscal year (FY) 2020 House Energy and Water Development and Related Agencies Appropriations Bill and the FY 2023 House Report for the Energy and Water Development and Related Agencies Appropriations Bill, the Senate explanatory statement for the Energy and Water Development Appropriations Bill, and the joint explanatory statement for the Energy and Water Development and Related Agencies Appropriations Act, this report provides a summary of the workforce programming implemented by the U.S. Department of Energy (DOE) in FYs 2011–2022.

An inventory across DOE's offices indicated that, in this timespan, 32 offices engaged in workforce development and readiness initiatives, implementing a total of $2.3 billion in funding for 158* distinct programs (589 in total, counting each year a program reoccurred separately). These DOE efforts have supported U.S. national, energy, and economic security, including contributing to the development of the workforce in key technology areas such as nuclear, fusion energy, bioenergy, manufacturing, industry, geothermal, and hydrogen and fuel cells.

Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA)-funded workforce activities were not yet implemented in FY 2022 and are not included in this report. The programs considered in this report were aggregated to provide a picture of DOE's workforce programming from FY 2011–2022. The programs reported in this inventory include Science, Technology, Engineering, and Math (STEM) training, outreach activities, and student research programs—this scope differs slightly from the annual Committee on Science, Technology, Engineering, and Math Education (CoSTEM) data calls and reports that DOE has contributed to since its first report for FY 2012.[1]

The following key observations and recommendations are further detailed in the remainder of this report:

Key Findings:

1. DOE has made significant investments in nuclear workforce priorities. Seventy percent of DOE's workforce investments went to nuclear programming. Nuclear programming included security-related priorities, as well as programs seeking to foster interest in nuclear energy work, especially for undergraduate or graduate students and Minority Serving Institution (MSI) students or faculty.
2. Reflecting DOE's historic focus on increasing student interest and skills in the sciences, sixteen percent of DOE's workforce funding has focused on cross-cutting science topics. The technologies receiving the most funding were nuclear (70 percent), followed by funding for manufacturing/industry (3 percent), fossil energy (3 percent), and buildings (2 percent).

* Note: *This data does not include the Energy Technology University Prize, Energy I-Corps, and the Technology Commercialization Internship Programs overseen by the Office of Technology Transitions.*

3. Colleges and universities implemented 59 percent of DOE's workforce funding, followed by government-affiliated organizations (primarily DOE's National Laboratories, including a few non-profit entities, some states, territories, and some universities/students because) (23 percent), and workforce/industry consortia (12 percent).
4. Almost all (83 percent) of DOE workforce programming served multiple geographies.
5. Reflecting DOE's historic focus on strengthening the energy research and development workforce:
    a. The most frequently funded target beneficiaries (excluding specifically targeted MSI students) were undergraduate and graduate students (80 percent of DOE workforce funding). MSI students or faculty were the second-most targeted group (12 percent of DOE workforce funding).
    b. Education and training were the predominant efforts, receiving 86 percent of DOE's workforce funding. Other efforts included research competitions (10 percent) and curriculum development (two percent).

This pattern of investment shows a strong emphasis on developing the professional STEM and research and development workforce, which aligns with DOE's historic role as a research and development (R&D) agency.

To support implementation of BIL and IRA investments, DOE has reorganized its offices under two Under Secretaries for (1) science & innovation; and (2) infrastructure. With the focus on infrastructure and program deployment, there are opportunities to consider DOE's role in developing the energy workforce to go beyond R&D to support demonstration and deployment activities.

Building and maintaining a reliable, secure, and resilient 21st century energy system will require a highly skilled, diverse, and distributed workforce with best-in-class scientists and engineers, as well as construction, manufacturing, operations, and maintenance workers.[2] DOE is well-positioned to both lead and support energy workforce development activities to serve America's diverse workers, support the needs of employers, and ultimately meet multi-faceted demands of the 21st century energy system.

Recommendations: The Biden-Harris Administration set a bold agenda to upgrade and modernize infrastructure, address the climate crisis, and build a clean and equitable energy economy that achieves carbon pollution-free electricity by 2035, and put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050 to the benefit of all Americans.[3] Continuing to fund workforce programs related to STEM education and the energy R&D pipeline remains important to achieving these goals. Rapidly undertaking this shift towards a clean energy economy also requires the United States to prepare for and meet a growing need for deployment workers to construct, produce, operate, and maintain diverse and distributed energy technology. DOE must, accordingly, assess current and future energy workforce needs and its role in supporting people implementing energy programs.

Congress has recognized this and established the 21st Century Energy Workforce Advisory Board under BIL Section 40211 (42 U.S.C. § 18744). This Advisory Board, recently stood up by the Office of Energy Jobs, is composed of 14 energy sector experts from outside of government (with experts representing various energy stakeholders including unions, community colleges, philanthropy, research, and industry).[4] The Advisory Board is tasked with developing a strategy to support current and future energy sector needs, including training underrepresented workers, retraining displaced energy sector workers, providing opportunities for students to access energy sector jobs, and working with other relevant Federal, state, and local agencies and organizations. It will provide a report to the Secretary of Energy that includes findings and the proposed workforce strategy for the Department of Energy.

The Advisory Board's findings and recommendations will help guide DOE in its workforce programming as the U.S. energy sector continues to transform.

DOE Workforce Development Programming, FYs 2011 to 2022

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I. Legislative Language

This report responds to pages 83–84 of the FY 2020 House Energy and Water Development and Related Agencies Appropriations Bill Report 116-83:[5]

> *The Committee recognizes the need to ensure that the nation has a ready, capable workforce both for today and the next generation to meet changing energy demands and safeguard the nation's nuclear security. The Department has a long history and unique opportunity of training and supporting the science, technology, engineering, and mathematics workforce. The Department is directed to provide to the Committee not later than 90 days after enactment of this Act a report that includes an inventory of workforce development and readiness programs supported throughout the Department. The inventory shall include current programs, past programs over the last 10 years, and recommendations for the Department to improve or expand its workforce development efforts. The report shall also include specific recommendations addressing workforce readiness to meet the Department's nuclear security missions.*

In FY 2023, page 93 of the House Energy and Water Development and Related Agencies Appropriations Bill Report 117-394 stated:[6]

> *The Committee recognizes the need to ensure that the nation has a ready, capable workforce both for today and the next generation to meet changing energy demands and safeguard the national nuclear security. The Department has a long history in and unique opportunity of training and supporting the science, technology, engineering, and mathematics (STEM) workforce. The fiscal year 2020 Act directed the Department to provide a report that includes an inventory of workforce development and readiness programs supported throughout the Department. The inventory was required to include current programs, past programs over the past 10 years, and recommendations for the Department to improve or expand its workforce development efforts. The report was required to include specific recommendations addressing workforce readiness to meet the Department's nuclear security missions. The Committee is still awaiting this report and directs the Department to provide a briefing on the status of this report not later than 15 days after enactment of this Act.*

The Senate Energy and Water Development Committee also included a follow-up request for this inventory in the Senate's Explanatory Statement for the Energy and Water Development Appropriations Bill, 2023 on page 70:[7]

> *Workforce Development. — The Committee recognizes the need to ensure that our Nation has a ready, capable workforce both for today and the next generation to meet changing energy demands and safeguard our National nuclear security. The Department has a long history in and unique opportunity of training and supporting the science,*

technology, engineering, and mathematics workforce. The fiscal year 2020 Act directed the Department to provide a report that includes an inventory of workforce development and readiness programs supported throughout the Department. The inventory was required to include current programs, past programs over the past 10 years, and recommendations for the Department to improve or expand its workforce development efforts. The report was required to include specific recommendations addressing workforce readiness to meet the Department's nuclear security missions. The Committee is still awaiting this report and directs the Department to provide the report immediately.

The Department is encouraged to prioritize training and workforce development programs that assist and support workers in trades and activities required for the continued growth of the U.S. energy efficiency and renewable energy sectors, including training programs focused on building retrofit, energy technology implementation, and the electric vehicle industry. The Department is encouraged to continue to work with 2-year, community and technical colleges, labor, and nongovernmental and industry consortia to pursue job training programs, including programs focused on displaced fossil fuel workers, that lead to an industry-recognized credential in the renewable energy and energy efficiency workforce. The Committee recognizes the Department's collaborations with the Department of Defense to address national security priorities including climate change and electric infrastructure. The Committee recognizes the Department's individual education and workforce development programs relating to the intersection of national security and energy but encourages interdepartmental coordination on the creation or modification of these programs.

Finally, the joint explanatory statement for the FY 2023 Energy and Water Development and Related Agencies Appropriations Act (168 Cong. Rec. S8347, 2022) stated on page 43: "The agreement reiterates House direction on this topic."[8]

II. Background

Background on this Report

The FY 2020 House Energy and Water Development and Related Agencies Appropriations Bill originally requested the Department of Energy provide a report to Congress with an inventory of the workforce development and readiness programs supported by DOE over the previous ten years. Both the FY 2023 House Report and Senate explanatory statement inquired about this report again, and the joint explanatory statement stated it reiterated House direction on the topic.

Subsequently, the Office of Energy Jobs (within DOE's Office of Policy) circulated an information request across DOE to inventory workforce programming from FY 2011 through FY 2022. As a result, 32 offices[9] at DOE submitted data on the workforce programs implemented from Fiscal Year 2011 through 2022. Each office was asked to provide information about their workforce

programs' fiscal years of obligation, funding dollar amounts, funding recipients, geographic locations, focus areas, program types, activity types, target audiences, implementers, cross agency collaborations, and a brief description of deliverables.

DOE offices recorded creating 158* distinct programs (589 programs in total if counting each FY as a separate program), totaling approximately $2.3 billion over this 2011–2022 FY period. Analysis of the trends and details of these programs and activities (with additional information linked when possible) is provided in the following sections. The investments in education, training, and workforce development detailed in this report are based on office self-reporting.

DOE's programs reported for this inventory and report include Science, Technology, Engineering, and Math (STEM) training; outreach activities; and student research programs as part of the workforce development programing of offices. DOE has reported its dedicated STEM training programs through the White House's Office of Science and Technology Policy (OSTP) Committee on Science, Technology, Engineering, and Math Education (CoSTEM) annual progress reports to Congress. [10] The scope of this DOE report extends beyond and differs slightly from these OSTP data calls and reports to include non-STEM programs as well.

DOE's 17 National Laboratories often work in conjunction with DOE offices, and some of these collaborative programs were captured in this report and inventory. The National Laboratories' role in scientific innovation and STEM programming is noteworthy and broad. In addition to the programs and activities funding directly by DOE appropriations, the DOE National Laboratories carry out programs and activities using non-DOE funding to advance STEM training and education (particularly at the K-12 level) that is important, and particularly impactful to their immediate regions, but not in the scope of this inventory or report.

Additionally, DOE's Research, Development, Demonstration or Deployment (RDD&D) funding awards have substantially contributed to the training of students, postdocs, technical staff, and early career researchers; however, because of limited reporting requirements on program personnel funded under financial assistance awards, DOE currently has a limited ability to quantify the impact of those awards on workforce development.

* Note: *This data does not include the Energy Technology University Prize, Energy I-Corps, and the Technology Commercialization Internship Programs overseen by the Office of Technology Transitions.*

Table 1: Program Recurrence*

Recurring Programs	**68 recurring programs, recurring an average of 7.3 years**
One-Time Programs	90 one-time programs
TOTAL DOE WORKFORCE PROGRAMS	158 distinct programs; 589 in total if counting each program year separately

Background on DOE Workforce Development Programming

As the energy needs and priorities of the U.S. are growing and changing, so too are energy workforce training needs and DOE's areas of focus. Originally created in 1977, DOE was tasked with defense responsibilities related to nuclear weapons and Federal energy needs. Over time, its priorities have included fundamental research, energy development and regulation, nuclear stockpile stewardship, addressing environmental challenges, education, and more.[11] To meet each of these priorities, DOE has relied on a robust science, energy, and nuclear security workforce.

In the past decade, DOE workforce initiatives have aimed to equip and inspire the American science and energy workforce to further national nuclear security and pursue the science, technology, and engineering challenges to meet the nation's changing energy needs. This has generally involved investing in research-related initiatives, as DOE sought to inspire and train students to work in energy-related research and careers. While today's energy workforce will benefit from DOE's continued funding to support training and careers in research and development, DOE has an opportunity to invest in the energy workforce to support the significant demonstration and deployment of energy technologies necessary to meet multi-faceted energy goals.

As the U.S. transitions to a clean energy economy, deployment, and implementation-related professions such as those in clean energy infrastructure construction, manufacturing and production, operations, and maintenance will require a significant number of skilled technical and trades workers. Many energy jobs will not require a 4-year or professional degree but instead are accessible through 2-year programs or on-the-job training opportunities, such as apprenticeships.[12] This means DOE need not wait for the next generation of energy workers to be trained but can design deployment programs to support the training of new energy workers. The implementation of IRA, which rewards clean energy developers with enhanced tax credits based on utilization of registered apprentices, is one such approach to growing the workforce through deployment activities. In addition, DOE is encouraging its funding recipients, particularly for demonstration and deployment programs, to invest in workforce education and training, such as registered apprenticeship and quality apprenticeship readiness programs. DOE has, historically, rarely funded workforce training for trades/blue collar workers, and partnerships with trades schools and union training programs have been almost non-existent.

III. Workforce Program Inventory (FY 2011-2022 Findings)

The key findings from the inventory of DOE's workforce programming are:

1. DOE has made significant investments in nuclear workforce priorities. Seventy percent of DOE's workforce investments went to nuclear programming. Nuclear programming included security-related priorities, as well as programs seeking to foster interest in nuclear energy work, especially for undergraduate or graduate students and Minority Serving Institution (MSI) students or faculty.
2. Reflecting DOE's historic focus on increasing student interest and skills in the sciences, 16 percent of DOE's workforce funding has focused on cross-cutting science topics. The technologies receiving the most funding were nuclear (70 percent), followed by funding for manufacturing/industry (3 percent), fossil energy (3 percent), and buildings (2 percent).
3. Colleges and universities implemented 59 percent of DOE's workforce funding, followed by government-affiliated organizations (primarily DOE's National Laboratories) (23 percent), and workforce/industry consortia (12 percent).
4. Almost all (87 percent) of DOE workforce programming served multiple geographies.
5. Reflecting DOE's historic focus on strengthening the energy research and development workforce:
    a. The most frequently funded target beneficiaries (excluding specifically targeted MSI students) were undergraduate and graduate students (80 percent of DOE workforce funding). MSI students or faculty were the second-most targeted group (12 percent of DOE workforce funding).
    b. Education and training were the predominant efforts, receiving 86 percent of DOE's workforce funding. Other efforts included research competitions (10 percent) and curriculum development (two percent).

The following sections provide further data and details to these findings.

Finding 1: DOE Workforce Activities Related to Nuclear Programming

From DOE's founding, it has been tasked with maintaining and protecting the U.S. nuclear arsenal. The National Nuclear Security Administration (NNSA) is a semi-autonomous agency within DOE that has responsibility for the management and security of U.S. nuclear weapons. NNSA and other DOE offices (especially the Office of Nuclear Energy and the Office of Nuclear Physics in the Office of Science) have made significant, continuous investments in nuclear workforce activities.

Seventy percent of DOE's workforce investments (programs/activities) supported nuclear programming to some extent (see Table 2 below). This figure does not include programs that had an option for engagement on nuclear technology, like the Community College Internship program that places community college students as paid interns in technological activities–which can include nuclear technologies—at DOE laboratories.[13]

The primary target audiences of nuclear and nuclear-related workforce programs were undergraduate/graduate students and MSI (including Historically Black Colleges and Universities [HBCU]) students and faculty. Nuclear programs broadly intended to increase professional student expertise and interest in working in nuclear energy/security provide intensive and hands-on training in nuclear-related topics, including stockpile stewardship,[14] particle accelerators,[15] nuclear/radiochemistry,[16] and nuclear physics.[17] The nuclear-related programming covered a range of topics, including boosting nuclear energy career awareness for middle school students,[18] training graduate students on how to conduct research with radioactive ion beams,[19] and a place-based initiative to connect community members with training for skills needed by the Savannah River Site.[20]

Table 2: Overview of Nuclear-Related Workforce Programming (aggregated from FY 2011–FY 2022)

Technology Area	Target Beneficiaries	Sum of Dollar Amount ($Million)	% of Nuclear Funding	% DOE's Workforce Funding
Nuclear Technology	Undergraduate/Graduate Students	$1,406.3	85%	59%
	MSI (including HBCU) Students or Faculty	$219.3	13%	9%
	Tribal communities[21]	$27.5	1%	2%
	K-12	$4.2	<1%	<1%
	Trade, Technical, or Community College Students	$2.9	<1%	<1%
	Registered Apprentices	$0	n/a	n/a
	Current Professionals	$0	n/a	n/a
	Unemployed or Not in Labor Market	$0	n/a	n/a
	Transitioning Energy Sector Workers	$0	n/a	n/a
Nuclear Total		***$1,089.4***		***61%***

Finding 2: DOE Workforce Activities' Technology Areas

DOE's workforce funding has flowed to a variety of science and technology areas (see Table 3 and Charts 1 and 2). Historically, DOE's workforce support has focused on increasing student interest and skills in the sciences to build a robust pipeline of workers in basic research and energy technology research and development. Accordingly, 16 percent of DOE workforce funding has focused on cross-cutting science and technology topics. Programs funded in this area have included those supported through the Office of Science's (SC) Workforce Development for Teachers and Scientists (WDTS) such as the Science Undergraduate Laboratory Internship and the Community College Internship programs that support internships at DOE National Labs, and the DOE National Science Bowl® that promotes science and energy literacy[22]. The Computational Sciences Graduate Fellowship, jointly funded by SC and NNSA, supports graduate students whose studies transcend the bounds of traditional academic disciplines.[23] Seventy percent of the "Science Cross-Cutting" funding, in fact, was related to high-performance computing (see Chart 2).

Nuclear technology (detailed further in the previous section of this report) received the most funding for any specific technology area (70 percent), followed by funding for manufacturing/industry (three percent), fossil energy (three percent), and buildings (two percent). Industrial Assessment Centers that match university students to small and medium manufacturers to provide free energy assessments were DOE's primary manufacturing/industry program, running continuously since 2016.[24] Fossil energy programs targeted a range of audiences, including one program that funded college students conducting innovative research on coal and carbon dioxide removal.[25] Building technology-related programs funded worker training and certification in efficient building technology, gave industry professionals practical experience in designing zero-energy programs,[26] and allowed facility managers to access online continuing education on building energy data analysis and controls.[27]

Nuclear Energy (NE) programs support students through its research and development (R&D) competitive opportunities. NE R&D projects provide students with hands-on work experience as part of the project research team. Over 2,400 undergraduate, masters, and PhD students were supported under Nuclear Energy University Program (NEUP) projects from 2010–2022. On average, NEUP projects support 43 undergraduate, 71 master's, and 66 PhD students each year. Additionally, NE provides undergraduate scholarships and graduate fellowships to students pursuing a nuclear energy-related degree. NE's efforts under the University Nuclear Leadership Program (UNLP) include a scholarship program targeting students attending community colleges and trade schools who are receiving training as nuclear energy-related technicians in areas such as nuclear operations, mechanical maintenance, health physics, welding, etc. The UNLP graduate fellowship also includes a 10-week internship at one of the National Laboratories or other NE-approved facility, which provides students with additional mentorship during their graduate research, as well as numerous networking opportunities with nuclear professionals. Ninety-three percent of NE's concluded UNLP fellows are currently working in nuclear energy. From 2010–2018, half of all nuclear engineering PhDs were supported through NE's UNLP scholarship and fellowship program or NEUP funds.

Many of the workforce programs went beyond research to focus on the implementation side of energy technology. This included training on residential heat pump installation through community colleges;[28] providing technical assistance to programs that raise the level of building science and energy efficiency knowledge in the nation's building-related workforce;[29] supporting the professional development of instructors training the solar photovoltaic and solar heating and cooling installation workforce;[30] educating real estate agents about solar energy systems;[31] creating trainings on the next generation of energy codes for the construction industry;[32] and training firefighters on how to respond to incidents with new building efficiency, solar, storage, and vehicle technologies.[33] While creative and important, these programs cannot touch more than a small fraction of the total workers in these occupations.

Additionally, funding was put towards developing the research and development workforce for renewable energy technologies such as bioenergy, fusion energy, geothermal energy, solar energy, and wind power. Programs included funding opportunities such as internships and fellowships for students interested in researching and advancing climate-friendly technologies, the development of solar energy training materials for construction professionals, and research competitions on innovative wind-turbine designs.[34]

Table 3: Overview of Technology Areas (aggregated from FY 2011–FY 2022)

Technology Area	Funding Amount ($Million)	% of DOE's Workforce Funding
Nuclear	$1,660.2	70%
Science Cross-Cutting	$376.5	16%
Manufacturing/Industry	$67.3	3%
Fossil Energy	$63.2	3%
Buildings	$41.4	2%
Vehicles	$37.3	2%
Solar	$32.4	1%
Electric Grid	$21.0	1%
Wind	$18.4	1%
Clean Energy Cross-Cutting	$16.1	1%
Bioenergy	$8.5	<1%
Distributed Energy Resources (DERs)	$8.0	<1%
Hydrogen and Fuel Cells	$4.9	<1%
Water Power	$4.6	<1%
Other	$4.5	<1%
Fusion Energy	$4.4	<1%
Geothermal	$2.2	<1%
Grand Total	***$2,370.8***	***100%***

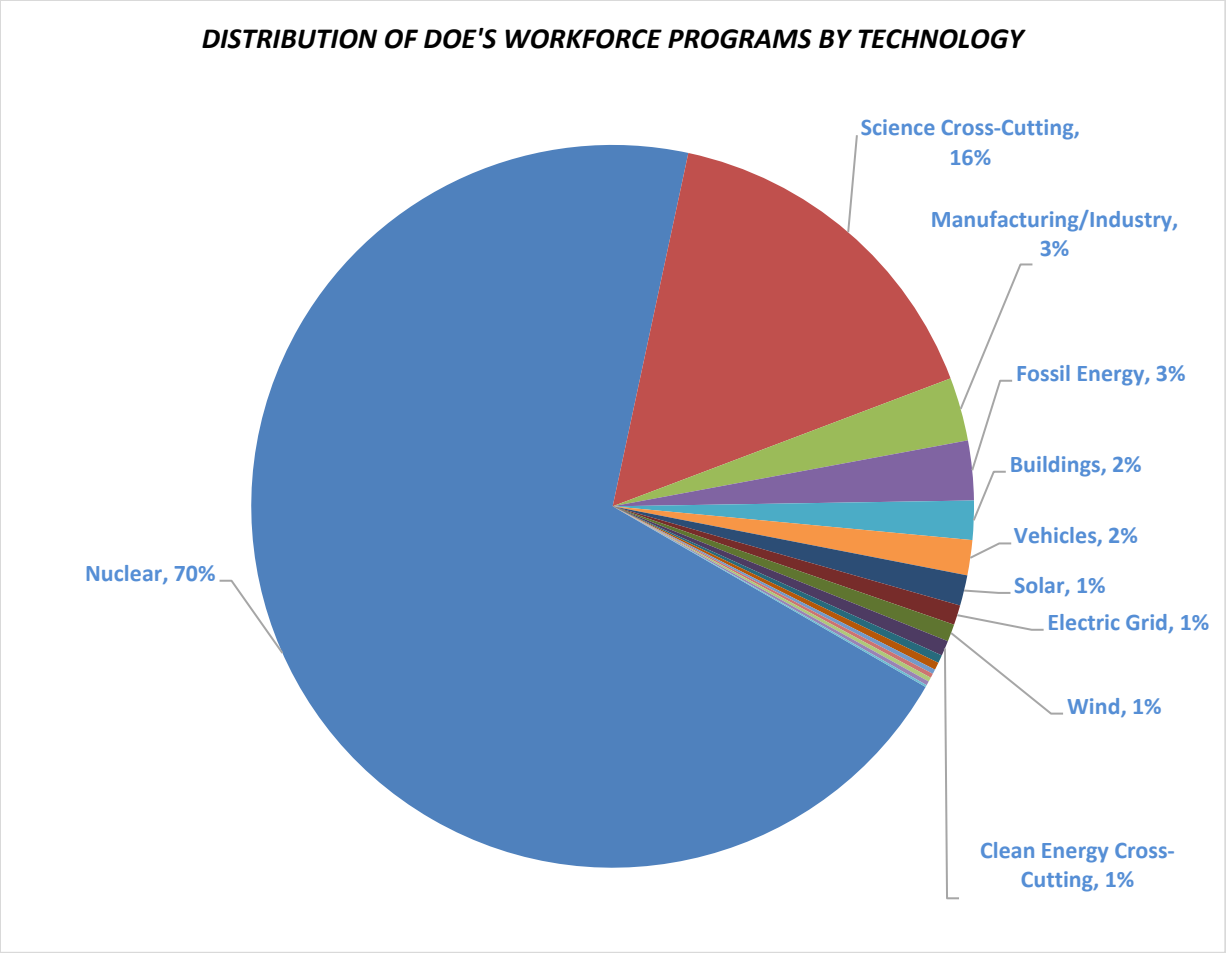

Chart 1: Visualization of DOE's Workforce Funding Technology Areas (aggregated from FY 2011-FY 2022). Technologies contributing <1% are not labeled in graph (Bioenergy, Distributed Energy Resources, Hydrogen and Fuel Cells, Water Power, Fusion Energy, Geothermal, and Other).

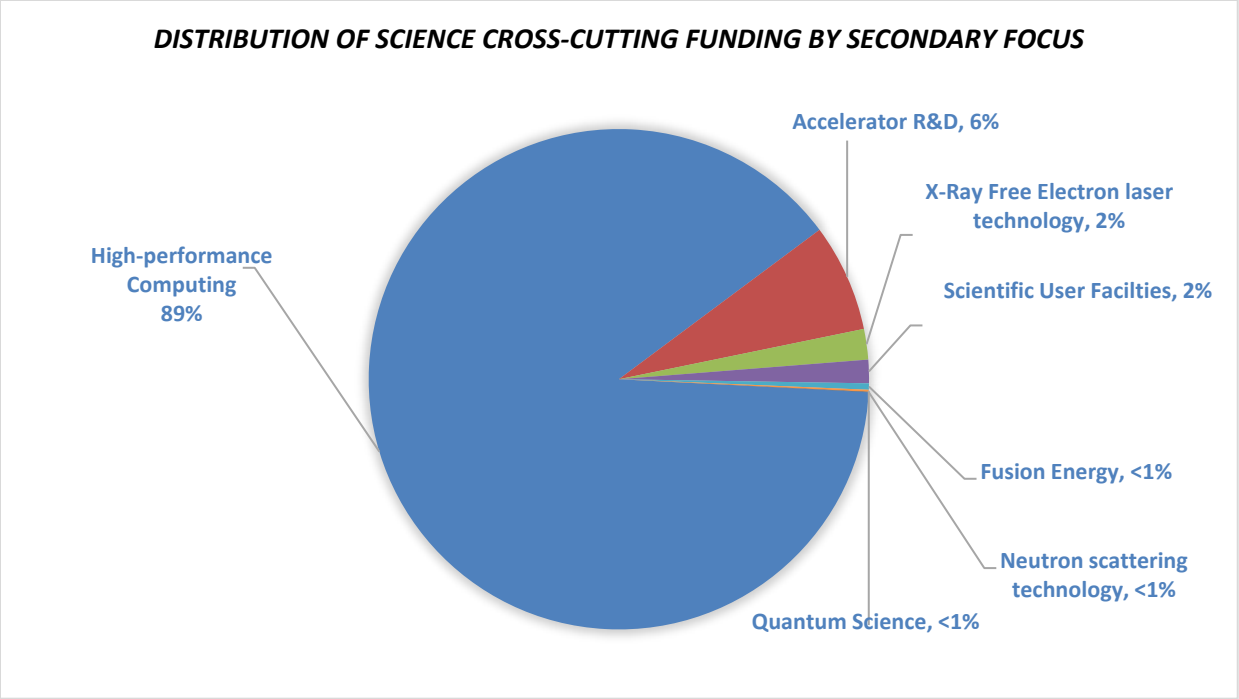

Chart 2: Visualization of Secondary Focuses of Science Cross-Cutting (aggregated from FY 2011–FY 2022)

Finding 3: DOE Workforce Activities' Implementers

Colleges and universities implemented the highest amount of DOE workforce funding (59 percent). Programs implemented by universities ranged from funding the Pennsylvania State University to develop a curriculum for building energy modeling[35] to funding a talent pipeline of MSI (including HBCU) students in clean hydrogen work.[36]

Government-affiliated organizations—primarily National Laboratories—implemented 23 percent of DOE workforce funding (see Table 4 and Chart 3 below). DOE's 17 National Laboratories lead the Nation in scientific innovation while addressing large scale and complex research and development challenges.[37] They implemented workforce programs ranging from the annual AlgaePrize competition (that encourages students to invent technologies within the commercial algae value chain)[38] to an internship for students to gain experience in supporting Tribal renewable energy programs.[39] The Office of Nuclear Energy implemented a Distinguish Early Career Program (DECP) to provide stable support to faculty to form impactful research groups, innovative lines of inquiry, educational approaches, and critical new research directions that will drive the next generation of nuclear energy innovation and workforce. The impact of DOE's RDD&D grants on training the future energy and STEM workforce was not in the scope of this report. Such awards substantially contribute to the training of students, postdocs, technical staff, and early career researchers; however, because of limited reporting requirements on program personnel funded under financial assistance awards, DOE currently has a limited ability to quantify the impact of those awards on workforce development. These awards are

predominately carried out by institutions of higher education and the DOE National Laboratories.

Workforce or industry consortia (i.e., implementing groups composed of multiple different entities—such as a local government and a community college working together) implemented 12 percent of the funding. Including multiple perspectives in implementation led to unique programming such as a conference to connect, empower, and inform undergraduate female physics students.[40]

Table 4: Overview of Workforce Development Implementers (aggregated from FY 2011–FY 2022)

Type of Implementer	Funding Amount ($Million)	% of DOE's Workforce Funding
College or University	$1,393.3	59%
National Labs or Other Government-Affiliated Organization	$538.9	23%
Workforce or Industry Consortium	$276.5	12%
Non-profit Research Organization	$116.1	4.9%
Other	$25.2	1%
Non-Governmental Organization (NGO)	$10.9	<1%
Community-Based Organization[41]	$8.1	<1%
Labor Union-Private Sector Partnership	$1.4	<1%
2-Year Community and Technical College	$0.5	<1%

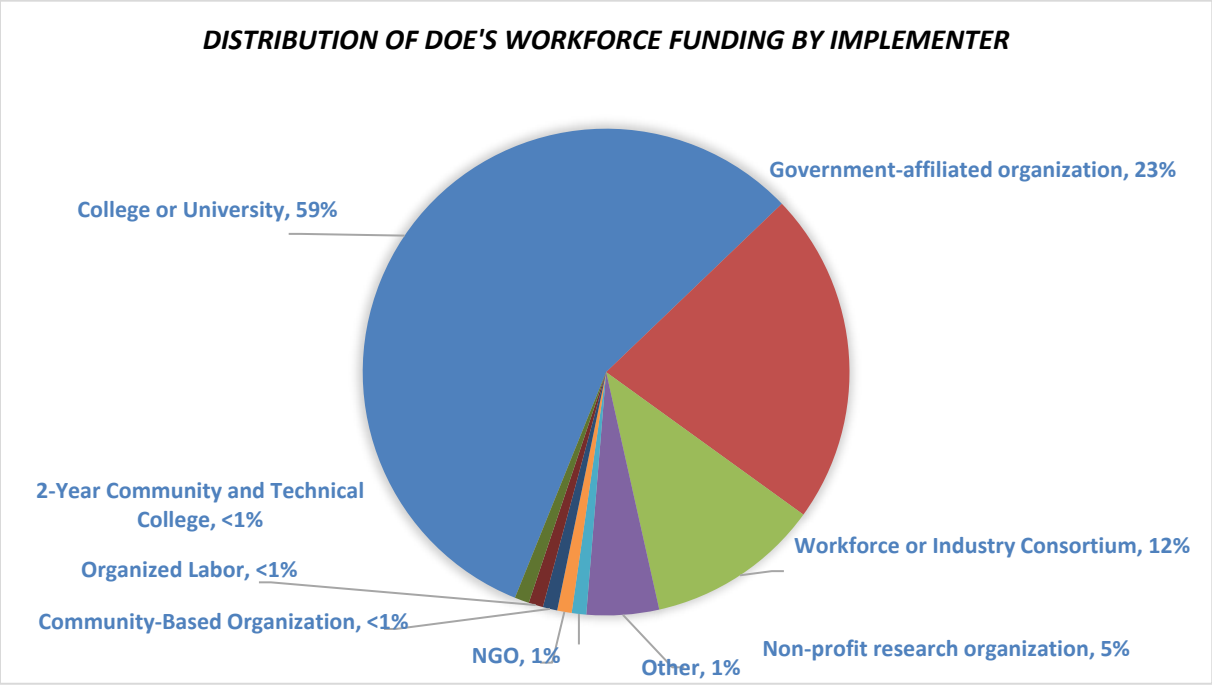

Chart 3: Visualization of DOE Workforce Funding Implementers (aggregated from FY 2011–FY 2022)

Finding 4: DOE Workforce Activities' Geographic Reach

DOE's workforce funding had a large reach—87 percent of funding was for programs that included multiple domestic regions and 11 percent included multiple domestic and international locations. The DOE National Science Bowl® that engages thousands of middle school and high schools students each year in competitions that engage and inspire students in STEM[42], and a program that retrains and connects veterans to jobs in Distributed Energy Resource (DER) technologies[43] are two of the many workforce-related programs reaching individuals in various corners of the U.S. Programming that reached across international borders included a dynamic, standards-aligned program that invited students to explore the many applications of nuclear science.[44]

Regional-specific programs (See Table 5) included a three-week nuclear physics program for Hampton University (a HBCU) students[45] (located in "South" in Table 7) and a training on sensors and controls for public building operators in rural Alaska (located in "West" in Table 5).[46]

Table 5: Overview of DOE Workforce Programming by Geographic Area (aggregated from FY 2011–FY 2022)

Geography (Census Bureau-designated regions)	Funding Amount ($Million)	% of DOE's Workforce Funding
Multiple (domestic)	$2,065.7	87%
Multiple (domestic and international)	$269.6	11%
West	$14.8	1%
South	$8.3	<1%
Midwest	$6.7	<1%
Northeast	$5.6	<1%

Finding 5: DOE Workforce Efforts' Target Beneficiaries, Type of Activity, and Type of Effort

In line with DOE's historic focus on building up the science and energy research and development workforce pipeline, most of its workforce funding has flowed to activities engaging students, with 80 percent of funding primarily targeting undergraduate and graduate students, not including another 12 percent targeting MSI (including HBCU) students or faculty (see Table 6 and Chart 4 below). Workforce programs for students included graduate thesis research opportunities at DOE laboratories that prepared students for careers critically important to the Office of Science's mission;[47] an intensive four-day training on opportunities in ultrafast science (which is the basis for technology like X-rays;[48, 49]) and paid internships with a mentorship focus for students enrolled at a MSI with NNSA.[50]

Current professionals were the target beneficiary of 3 percent of workforce funding, benefitting from programs enhancing their current work. This included energy service professionals receiving continuing education on deploying flexible load technology,[51] and state-level public officials receiving resources and training on handling the future cost and continued public acceptance of solar energy.[52]

Table 6: Overview of Target Beneficiaries (aggregated from FY 2011–FY 2022)

Target Beneficiaries	Funding Amount ($Million)
Undergraduate/Graduate Students	$1,906.4
MSI (including HBCU) Students or Faculty	$277.9
Current Professionals	$79.3
K-12	$51.0
Technical/Community College Students	$30.2
Tribal Communities	$29.6
Veterans	$5.2
Displaced energy workers	$4.0
Unemployed Adults	$2.9
Reentry Population & Others with Employment Barriers	$1.4
Women	$0.7
18–24-year-olds (not in school)	$0.5

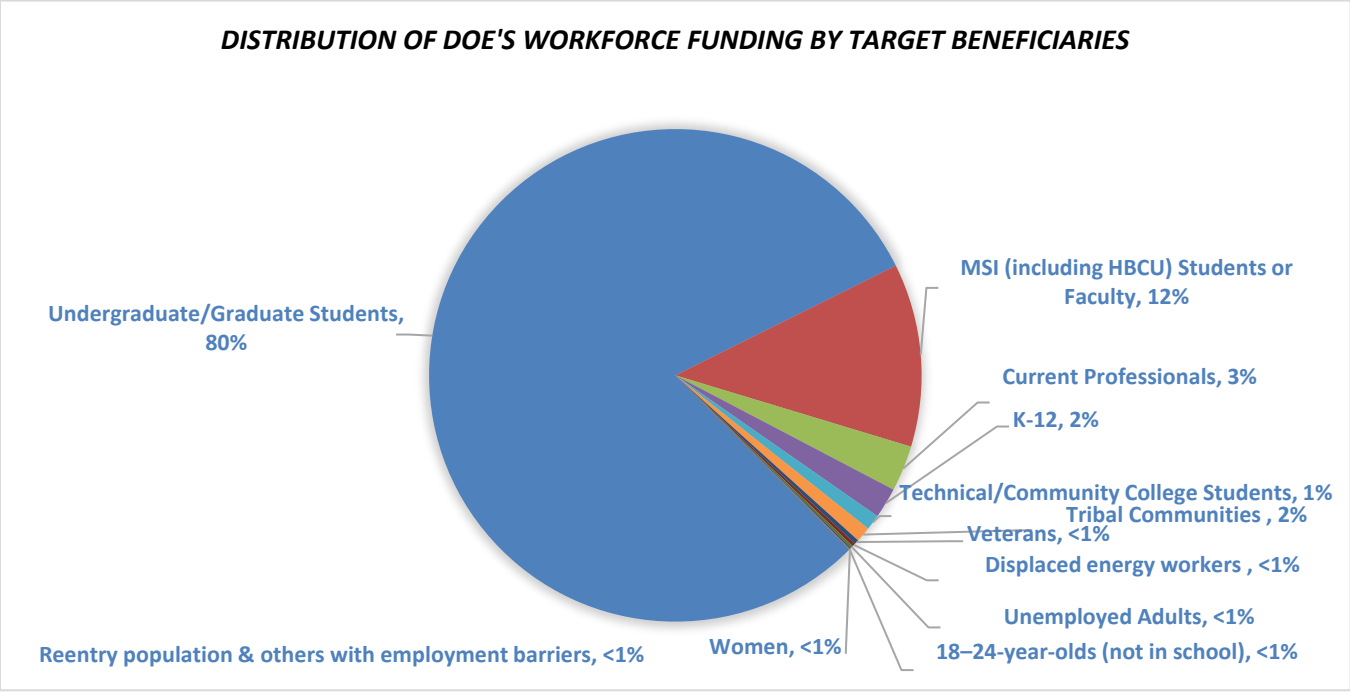

Chart 4: Visualization of Target Beneficiaries (aggregated from FY 2011–FY 2022)

Education and Training was the type of effort that received the majority (86 percent) of DOE workforce funding (see Table 7). Research competitions (10 percent) and curriculum development (two percent) received a distant second and third. These figures reflect DOE's focus over the past decade on developing a strong pipeline of students interested in energy research and careers. Education and training included programs like the multi-year Stewardship Science Academic Alliance (SSAA). The SSAA supports scientific research in areas crucial to the stockpile stewardship program and support hands on training for graduate students in areas relevant to stockpile stewardship through SSAA Centers of Excellence, the Stewardship Science Graduate Fellowship, and the Laboratory Residency Graduate Fellowship.[53]

Other programs intended to increase diversity in energy-related research, including, for example, one program connecting MSI faculty with National Laboratories to build their research skills.[54] Funding for internships was also included in Education and Training. Opportunities included paid internships in science and engineering research at National Laboratories for undergraduates[55] and research internships on plasma and fusion with a stipend.[56]

Table 7: Overview of Type of Effort (aggregated from FY 2011–FY 2022)

Type of Effort	Sum of Dollar Amount ($Million)	% of DOE's Workforce Funding
Education and Training (including MSI students)	$2,036.3	86%
Research Competition	$245.5	10%
Curriculum or Training Standard Development	$38.4	2%
Professional Development or Upskilling	$24.2	1%
Career Awareness	$12.9	1%
Strategic Activities (including sector strategies, workforce research, career mapping, and skills mapping)	$12.4	1%
Other	$1.3	<1%

IV. Enhancing DOE's Workforce Development Efforts

As revealed by the inventory of past training and workforce development programming detailed in this report, DOE's traditional workforce development focus has been on preparing a strong energy R&D workforce, particularly by strengthening opportunities available to STEM undergraduate and graduate students.

Presently, DOE has an opportunity to expand its reach to other groups and prepare the U.S. workforce to not only innovate but also facilitate the deployment of energy technologies. The Bipartisan Infrastructure Law (BIL), the IRA, and the White House's initiatives on job creation, job quality, and job access have all set the stage for DOE to align its workforce development efforts with 21st century energy projections and needs. One example of this is a current DOE funding opportunity that will expand the Industrial Assessment Center program (that trains and matches students to provide energy assessments to manufacturers) beyond the 37 four-year institutions it currently works with into trade schools, community colleges, union training programs, and other institutions of higher education.[57]

Meeting the Department's nuclear security mission[58] requires addressing workforce readiness by:

1. **Supporting a broader spectrum of training pathways:** Ninety-eight percent of nuclear technology funding in FY 2012–2022 went to post-secondary students—85 percent targeted undergraduate and graduate students, and an additional 13 percent targeted MSI students or faculty (See Table 2). The need for specialized engineers (trained by these traditional paths) is ongoing to meet DOE's nuclear security mission, and DOE's influence on this pathway is still valuable. That being said, DOE can enhance its focus on other populations to help meet the need for traditional and emerging skilled nuclear technician positions throughout its laboratories, plants, and sites.
2. **Investing in target strategies to improve DEIA in nuclear-related careers**: A diverse nuclear workforce is paramount to meeting DOE's security mission. Programs such as the MSI Partnership Program (MSIPP) develop strategic partnerships and invest in student enrichment and curriculum development to provide training and reduce obstacles for traditionally underrepresented groups in nuclear careers. This recommendation builds on DOE's success in working towards the second of three goals of the Federal STEM Education Strategic Plan (published in December 2018) ("Increase diversity, equity and inclusion in STEM"). The FY 2021 CoSTEM Progress Report showed all DOE programs reporting a major outcome of the STEM investment contributes directly or indirectly to progress towards increasing DEIA in STEM. This is an important achievement, but it leaves room for growth for DOE programs to directly contribute to DEIA progress—the explicit prioritization of outreach efforts with intentional focus on underrepresented groups will allow DOE (and the energy sector) to tap the full talent of the American workforce.[59] DOE has recognized that this is important for its nuclear security mission, as can be seen in its strong programming with MSI students and faculty. DOE can continue to increase all types of diversity—racial, gender, ethnic, and more—in its nuclear workforce programs.

Congress has recognized the need for DOE to think strategically about the workforce and established the 21st Century Energy Workforce Advisory Board under BIL Section 40211 (42 U.S.C. § 18744). This Advisory Board, recently stood up by the Office of Energy Jobs, is composed of 14 energy sector experts from outside of government (with experts representing

various energy stakeholders including unions, community colleges, philanthropy, research, and industry). The Advisory Board is tasked with analyzing the effectiveness of DOE's workforce initiatives, crafting recommendations, and developing a strategy to support current and future energy sector needs, including training underrepresented workers, retraining displaced energy sector workers, and providing opportunities for students to access energy sector jobs.

This Advisory Board will assess ways for DOE to prioritize training and workforce development programs that assist and support workers in trades and activities required for the continued growth of the U.S. energy efficiency and renewable energy sector; to continue to work with 2-year, community and technical colleges, labor, and nongovernmental and industry consortia; to pursue job training programs, including programs focused on displaced fossil fuel workers, that lead to an industry-recognized credentials; and to coordinate with other Federal, state, and local agencies and partners on new and existing programs.

The Advisory Board's findings and recommendations will help guide DOE on expanding its workforce programming as the U.S. energy sector continues to transform.

V. Conclusion

From FY 2011–2022, DOE's workforce efforts focused on research and development career pathways to continue to safeguard our national nuclear security and advance clean energy technologies. These technologies are ready to be deployed, and DOE's workforce role, accordingly, can now expand to work with a wider range of partners and support a broader swath of the energy workforce. Ongoing DOE initiatives—such as the June 2022 Memorandum of Understanding with the Department of Labor (DOL),[60] the Battery Workforce Initiative, and the Industrial Assessment Centers, among many others—already demonstrate the promise of investing in partnerships to develop the deployment workforce.

The forthcoming report from the 21st Century Energy Workforce Advisory Board will present strategic recommendations to the Secretary on how DOE can support and develop a skilled energy workforce. Per BIL, this will identify ways for how the Department and National Laboratories can:

- Increase outreach to minority-serving institutions;
- Make resources available to increase the number of skilled minorities and women trained to go into the energy and energy-related manufacturing sectors;
- Increase outreach to displaced and unemployed energy sector workers;
- make resources available to provide training to displaced and unemployed energy sector workers to reenter the energy workforce;
- Identify the energy sectors in greatest need of workforce training; and
    - In consultation with the Secretary of Labor, develop recommendations for the skills necessary to develop a workforce trained to work in those energy sectors.[61]

As detailed by the BIL, the Secretary's response to the report will detail approval (and an implementation plan) or disapproval of each recommendation. Both the Advisory Board's report and the Secretary's response will be submitted to Congress.

DOE offices are ready to meet the moment and support broad, inclusive workforce pathways for an innovative and engaged energy workforce that is responsive to the U.S.' evolving energy needs.

VI. Data Appendix

This Report was based off program data submitted by DOE's offices. The following Data Appendix summarizes the data.

Program Name	Years Run (FY 2011-2022)	DOE Office	Total Funding Over All Years ($Million)	Brief Description
Cyberstrike	5 (FY 2018, 2019, 2020, 2021, 2022)	Office of Cybersecurity, Energy Security, and Emergency Response (CESER)	$4.0	CyberStrike is CESER's professional cybersecurity training for operational technology environments. Since its creation, CyberStrike has educated more than 1,500 individuals both domestically and internationally. The program offers continuing education credit for participants, modules with scenarios specific to both the electric and the oil and natural gas subsectors, and an instructor cadre comprised of the leading voices on operational technology cybersecurity for energy systems.
MSI STEM Research and Development Consortium (MSRD)	1 (FY 2022)	Office of Energy Efficiency & Renewable Energy (EERE)	$8.6	EERE has an interagency agreement through the Army to increase R&D with HBCU's and other MSI's through this MSI STEM R&D consortium.
Industrial Assessment Centers (IACs)	7 (FY 2016, 2017, 2018, 2019, 2020,	EERE/AMO (Advanced Manufacturing Office)	$67.3	The Industrial Assessment Centers (IACs) utilize engineering students to provide free energy assessments to small and medium manufacturers,

	2021, 2022)			training the future of the clean manufacturing workforce.
Algae Technology Education Consortium (ATEC)	7 (FY 2016, 2017, 2018, 2019, 2020, 2021, 2022)	EERE/Bioenergy Technology Office (BETO)WIP	$6.0	Since 2016, the ATEC works to improve public accessibility to information about bioenergy production through designing of specialized education and training programs, including MOOCs and a Community College Algae Cultivation Certificate Degree Program. The consortium supports formal and informal education pathways including STEM and vocational programs. This consortium is co-managed by the National Renewable Energy Laboratory and the Algae Foundation.
AlgaePrize	2 (FY 2021, 2022)	EERE/BETO	$.4	AlgaePrize is a new collegiate competition that encourages students to pursue innovative ideas for the development, design, and invention of technologies within the commercial algae value chain. Fast-growing and able to store energy from sunlight, algae can be transformed into a variety of products, such as fuel, food, fertilizer, industrial compounds, and animal feed.

Bioenergy Career Map	1 (FY 2016)	EERE/BETO	<$0.1	Developed a map of bioenergy careers.
Bioenergy Research and Education Bridge Program (BRIDGES)	1 (FY 2022)	EERE/BETO	$.5	Developed a brand-new case study-based education curriculum in partnership with ANL and Idaho National Laboratory, as well as education, community, industry, and other government partners.
Small Business Innovation Research (SBIR) Subtopic	1 (FY 2021)	EERE/BETO	$1.5	This SBIR subtopic (FY 2021 10b) piloted a research-driven workforce development tool widely applicable for the bioeconomy, establishing a partnership with business experts in bioenergy and/or inclusive workforce development.
Better Buildings Workforce Accelerators	1 (FY 2022)	EERE/BTO	$.5	Research analysis on workforce needs and gaps, publication of research papers, and providing technical assistance to Better Buildings Workforce Accelerator partners.
Building Technologies Office (BTO) Workforce Project	1 (FY 2021)	EERE/BTO	$.7	Residential heat pump training with California Community Colleges.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.8	New Mexico's Energy, Minerals and Natural Resources Department will create, develop, and deliver unique New Mexico Energy Conservation Code and International Energy Conservation Code and

				related above-code training modules.
Building Technologies Office Workforce Project	1 (FY 2020)	EERE/BTO	$2.1	Continuing education content for building code professionals on advanced building technologies, solar, batteries, and EV charging focused on safe and effective permitting processes.
Building Technologies Office Workforce Project	1 (FY 2019)	EERE/BTO	$.5	Green Buildings 101 Educational Content and Integration of modules into high school, community college, and professional association education programs.
Building Technologies Office Workforce Project	1 (FY 2019)	EERE/BTO	$.5	This program delivered an interactive and highly visual training curriculum with actionable information about advanced energy technologies, building science, and design and construction insights.
Building Technologies Office Workforce Project	1 (FY 2019)	EERE/BTO	$.5	This program designed and developed a statewide training and education program to support workforce development and the adoption of energy-efficiency technologies in residential and commercial buildings.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.5	This program created a training model to increase access to relevant information and technical assistance for identified technologies for the building workforce in Virginia and Florida.

Building Technologies Office Workforce Project	1 (FY 2019)	EERE/BTO	$.3	Online and field-based sensors and controls training for public building operators in rural Alaska.
Building Technologies Office Workforce Project	1 (FY 2019)	EERE/BTO	$.5	Online continuing education on building energy data analysis and controls for facility managers and building operators.
Building Technologies Office Workforce Project	1 (FY 2020)	EERE/BTO	$.5	This program provided resources and education for design and construction professionals to understand and implement practices in electrification space and water heating technology design and installation to ensure a quickly decarbonizing building stock.
Building Technologies Office Workforce Project	1 (FY 2020)	EERE/BTO	$.5	Continuing education content for building code professionals on advanced building technologies, solar, batteries, and EV charging focused on safe and effective permitting processes.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.7	Continuing education programs for energy services professionals on how to leverage FERC Order 2222 to deploy flexible load technologies.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.5	High-Efficiency Electrification Technology Training provided resources and education for design and construction professionals to understand and implement practices in electrification space and water heating technology design and installation to

				ensure a quickly decarbonizing building stock.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.7	On the job and online training program for multifamily cold climate heat pump installers
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.7	This program created a Workforce Development Platform to support high school students to access training content and job opportunities in modular, offsite building construction.
Building Technologies Office Workforce Project	1 (FY 2019)	EERE/BTO	$.5	Establish registered apprenticeship program for building energy controls professionals operating commercial buildings.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.4	Supported increased adoption of advanced building construction practices, specifically investigating how prefabricated construction and virtual building inspections can lead to energy and cost savings and related environmental benefits while revitalizing the industry and optimizing affordability in regional construction markets.
Building Technologies Office Workforce Project	1 (FY 2022)	EERE/BTO	$.3	Research analysis on workforce action areas for DOE, development of documents to identify key actions for DOE to collaborate with industry, labor groups, and other Federal agencies. Collaborated with credentialing organizations

				on systems to recognize comprehensive training programs.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.7	Pennsylvania State University created a multi-institution consortium to develop building engineering curricula, including fundamental skills in programming and data science and training in the use of modeling technologies such as EnergyPlus and Modelica.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.7	Developed course content to address identified competency gaps, with a primary goal of providing students the comprehensive skills necessary for design and construction of high-performance, energy-efficient residential buildings.
Building Technologies Office Workforce Project	1 (FY 2019)	EERE/BTO	$.4	The overarching goal of this program was to prepare a new generation of energy professionals that will enable widespread adoption of energy efficiency in new construction and existing buildings.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.7	Collegiate credential available through an architectural engineering program on building energy modeling.
Building Technologies Office Workforce Project	1 (FY 2021)	EERE/BTO	$.8	The program developed and demonstrated the value of a formal 14-hour supplemental curriculum to the Building Operators Certification Fundamentals

				program for pre-entry-level building operators that improves their literacy of grid-interactive efficient buildings (GEB) and occupant-centric control (OCC).
Building Technologies Office Workforce Project	1 (FY 2015)	EERE/BTO	<$0.1	Established Better Buildings Workforce Guidelines to recognize credentialing programs that train students to an established Job Task Analysis level of competence for commercial building professionals.
Green Building Career Map	1 (FY 2019)	EERE/BTO	$.5	Green Building Career Map resource to identify key occupations and build awareness.
Solar Decathlon	6 (FY 2011, 2013, 2015, 2017, 2021, 2022)	EERE/BTO	$10.2	The Solar Decathlon prepares innovators to design and construct high-performance, low-carbon buildings through collegiate competitions, professional continuing education, and high school programs.
Solar Decathlon Pathways (SD Pathways)	1 (FY 2022)	EERE/BTO	$.2	Solar Decathlon Pathways (SD Pathways) launched in fall 2022 to expand the mission of Solar Decathlon to younger students.
Solar Decathlon Professionals (SD Pro) Program	2 (FY 2021, 2022)	EERE/BTO	$.4	SD Pro is designed to provide industry professionals with an opportunity to develop building science expertise, gain practical experience designing zero energy projects, and earn continuing education credits (CEUs). Building on the

				success of DOE's Solar Decathlon collegiate competition, SD Pro is targeted at early to mid-career design professionals in residential and commercial building design.
Geothermal Collegiate Competition (GCC)	2 (FY 2021, 2022)	EERE/(GTO) Geothermal Technologies Office	$.9	The goal of the GCC is to provide students with an on-ramp to the renewable energy field and opportunities to engage with established industry professionals, as well as their local communities. The technical topic related to heating and cooling buildings, campuses, districts, or entire communities, as well as applications for geothermal heat pump technology.
Geothermal Design Challenge	3 (FY 2016, 2019, 2020)	EERE/GTO	$.7	Teams of 2 or 3 members researched data, interpreted information, and created a data visualization portfolio that told a compelling story about geothermal energy by answering each year's specific challenge question.
National Geothermal Student Competition	1 (FY 2014)	EERE/GTO	$.1	College teams generated two deliverables as part of GeoEnergy Is Beautiful 2014: (1) a clean, innovative infographic highlighting geothermal; and (2) an associated communications and outreach strategy with a plan for maximum public impact.

National Science Foundation's (NSF) INTERN	1 (FY 2022)	EERE/GTO	$.5	The NSF-DOE collaboration is part of NSF's INTERN program and will support 10 to 20 six-month research internships per year to work in the geothermal industry on projects that advance geothermal technologies.
Battery/Fuel Cell Workforce Research	1 (FY 2022)	EERE/(HFTO) Hydrogen and Fuel Cell Technologies Office	<$0.1	Planning effort for skills needed to develop Battery/Fuel Cell Workforce.
Developing a Workforce for a Hydrogen Technology Economy	1 (FY 2021)	EERE/HFTO	$2.7	Helped to develop newly trained personnel and to enable the existing workforce to migrate into the hydrogen field through a coordination of industry and education.
Fuel Cell Vehicle Guide for Students	1 (FY 2010)	EERE/HFTO	$.2	This project created a guide on how to teach students about fuel cell vehicles, with kits for hands on activity and mapped to science standards.
Hydrogen and Fuel Cells Career Map	1 (FY 2018)	EERE/HFTO	<$0.1	Visual career map with options for advancement, average salaries, and requirements for key positions.
MSI Hydrogen Workforce Training	1 (FY 2022)	EERE/HFTO	$2.0	To build a talent pipeline of untapped scientists and engineers from HBCUs and Other Minority Institutions to help bridge the gap in clean hydrogen workforce development.

Solar District Cup	1 (FY 2019)	EERE/(SETO) Solar Energy Technologies Office	$1.6	The Solar District Cup challenged multidisciplinary student teams to design and model distributed energy systems for a campus or urban district. The competition engaged students in engineering, urban planning, finance, and related disciplines to reimagine how energy is generated, managed, and used in a district.
Solar Technologies Office Workforce Project	1 (FY 2018)	EERE/SETO	$1.3	Robust solar industry growth created a shortage of U.S. workers knowledgeable in emerging DER technologies including networking, operational software, smart advanced inverters, smart advanced PV (photovoltaic) modules, and cybersecurity. This project focused on retraining military veterans and other qualified individuals to fill workforce gaps in those technologies. To bridge this workforce skills gap, the project established a complete learning and career advancement system for veterans, transitioning military personnel and other qualified individuals into the DER workforce. The project guided participants successfully through the process of program/vocation selection, curriculum enrollment, academic mentoring, degree or certificate attainment, job board enrollment,

				introduction to hiring managers at DER companies, and successful job acquisition.
Solar Technologies Office Workforce Project	1 (FY 2018)	EERE/SETO	$1.3	The Illinois Green Economy Network was a consortium of all 39 Illinois community colleges working to grow the green economy in the state. The network aimed to build capacity in sustainability and transform education by connecting business/industry and educators to resources, curating information, and tools, cultivating partnerships, and advocating for change.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$1.9	This program took an innovative approach to providing transitioning veterans with promising civilian career paths in solar energy while also providing the solar industry with highly qualified and motivated workers.
Solar Technologies Office Workforce Project	1 (FY 2018)	EERE/SETO	$2.0	The National Solar Jobs Accelerator program grew the pipeline of transitioning service members and veterans into the U.S. solar industry via two complementary efforts. The team offered a work-based learning model for transitioning service members and a matchmaking system that channeled veterans into

				appropriate training or employment opportunities. The Accelerator also undertook high-impact capacity-building activities that enhanced and streamlined veteran options for pursuing solar training and employment opportunities and incentivized employer participation over the long-term.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$.4	DOE funding helped the GW Solar Institute at the George Washington University develop multimedia solar energy training materials for a spectrum of diverse audiences. The resulting solar knowledge library serves as an invaluable resource for other Solar Training and Education for Professionals (STEP) awardees who are directly engaging and training communities as real estate agents, financiers, state regulators, and policymakers.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$.4	SETO funding went to Elevate Energy for their program that educates residential real estate agents, appraisers, and appraiser regulatory officials about solar energy systems through web-based, continuing education classes. The lack of current solar information for these professionals can slow demand for residential solar

				by decreasing its contribution to resale value and presenting challenges to home sellers with solar installations. The project also worked to add an expanded solar component to the Multiple Listing Service, or MLS, a suite of services used by real estate professionals to establish contractual offers on properties, facilitate cooperation with other brokers, and distribute listing information
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$.6	SETO provided funding to the Clean Energy States Alliance (CESA) to provide resources and training for public officials, mostly at the state level, on how to deal with two issues with important implications for the future cost and continued public acceptance of solar energy. 1. Ensuring inclusive participation in the solar economy, especially for those with low and moderate incomes and those without solar-friendly roofs, and 2. Helping consumers find and use reputable, competent vendors and contractors.
Solar Technologies Office Workforce Project	1 (FY 2020)	EERE/SETO	$1.4	With partial funding from DOE, the Underwriters Laboratory (UL) worked with the International Association of Fire Fighters to design, test and deliver a comprehensive educational training program focused on

				safe, effective, and operational emergency response to incidents involving building efficiency, solar, storage, and vehicle technologies.
Solar Technologies Office Workforce Project	1 (FY 2021)	EERE/SETO	$.8	The objectives of this project were to educate design and construction professionals on key principals of integrating solar energy into the built environment. The scope of the effort focused on architectural solar (which the project team defined as solar energy generating technology that has architectural significance or is coordinated with the architectural design process. This includes building-integrated photovoltaic (BIPV) facade and a rooftop PV system that is architecturally coordinated with rooftop vents early in the design process).
Solar Technologies Office Workforce Project	1 (FY 2018)	EERE/SETO	$6.0	The Grid Ready Energy Analytics Training with Data (GREAT with Data) initiative enhanced workforce readiness in the electric utility industry by focusing on the intersection of power systems and digital systems. The project developed and delivers open-source professional training and university course content in data science, cybersecurity, integration of solar photovoltaic and other

				Distributed Energy Resources (DERs), and information and communication technology for power systems workers in transmission and distribution. Through collaboration with utility and university partners, this initiative developed certifications, credentials, qualifications, and standards for the training and education needed in the electric utility workplace to help transform the grid.
Solar Technologies Office Workforce Project	1 (FY 2018)	EERE/SETO	$1.4	This program expanded existing efforts in Philadelphia to develop a replicable workforce training program for the region's growing solar industry. The CTE curriculum included solar installation, construction safety, an introduction to solar sales and design, and other job-readiness programs. Successful program graduates are placed in internships with local employers and get ongoing support from the program to increase the likelihood of job retention.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$1.0	SETO along with the Electric Power Research Institute and university, utility, and electric industry partners established a Distributed Technology Training Consortium in the western United States – GridEd West (the Center for Grid

				Engineering Education in the West). It leverages the existing structure, knowledge, and successes from the EPRI-led GridEd-East team.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$1.0	DOE's Solar office gave funding to the Foundations for Engineering Education for Distributed Energy Resources (FEEDER) Consortium. FEEDER is administered by the University of Central Florida and consists of seven universities, eight utilities, ten industry partners, and two National Labs. FEEDER undertakes research, curriculum development, and education and training activities in power systems engineering aimed at widespread adoption of distributed renewable energy resources and deployment of smart grid technologies.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$2.2	This program created an engagement strategy to facilitate the integration of state-of-the art solar training into existing professional development platforms for firefighters and fire code officials. This included using integrated technology solutions, such as online 3D interactive simulations and mobile tools and resources. Through this training and professional development platform, IREC aimed to train more than 10,000

				firefighters and fire code officials, who were projected to communicate the information to another 90,000 people.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$1.0	This program used a three-phase learning approach to develop a solar training program for state regulators, legislators, and energy officers using traditional instruction, interactive games and simulations, and peer exchange.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$.8	This program supported the development and dissemination of solar reference materials and training for building design professionals. The Trust for Conservation Innovation worked closely with its partner organizations, the Building Codes Assistance Project, and the Center for Sustainable Energy, to complete this project. The project targeted multiple interrelated audiences in the building design field, leveraging the similarity of educational materials needed and establishing consistency in and amplification for understanding.
Solar Technologies Office Workforce Project	1 (FY 2018)	EERE/SETO	$.6	The goal of the Multi-Sector Solar Career Training Initiative for Native Americans Project was to facilitate the transition of Native Americans and Native

				American Veterans into the solar industry job market to address both the high unemployment within these targeted communities and the need for a skilled workforce in the solar industry. The project objectives had two primary focuses; providing training and job placement assistance to individuals and increasing capacity for Native American Tribes and Tribal Communities to develop solar projects on their lands to increase workforce opportunities.
Solar Technologies Office Workforce Project	1 (FY 2018)	EERE/SETO	$.8	The Safer Foundation, which focuses on workforce development and programming for people in the criminal justice system, advanced its Solar Energy Demand Skills Training program to fill the growing workforce needs of the solar industry. The Safer Foundation and its partners across the state of Illinois provided participants with a comprehensive program based on interests and aptitudes. Experienced solar industry trainers, employers, and supervisors combined classroom training, hands-on experience in the lab, and real-world installations to enable participants to better understand the sales, design, and installation fields.

Solar Technologies Office Workforce Project	1 (FY 2018)	EERE/SETO	$.8	The Solar Ready Wisconsin initiative supported the development of a statewide network of industry stakeholders, training providers, and nonprofit organizations working to develop solar workforce capacity in Wisconsin and the surrounding region. In collaboration with a network of local community colleges, the Midwest Renewable Energy Association (MREA) created a program called the Wisconsin Solar Corps to provide job training and facilitate job placement for qualified candidates in the solar industry. MREA worked to make Solar Ready Wisconsin a replicable program that has the potential to be used across the Midwest.
Solar Technologies Office Workforce Project	1 (FY 2016)	EERE/SETO	$1.1	SETO funding helped the North American Board of Certified Energy Practitioners (NABCEP) develop three new industry-validated personnel certifications for individuals working in PV operations and maintenance and in mid-scale PV system design and installation. These new certifications filled the need for third-party validation of the skills and competence required for the solar labor force, as represented in professional credentials.

Solar Training Network	2 (FY 2011, 2016)	EERE/SETO	$12.1	The Solar Training Network connected solar workforce trainers, solar employers, and individuals interested in working in the solar industry. This project leveraged the experience and expertise of its team members to develop and expand training and workforce capacity building nationwide. It built on the success of an earlier SunShot program, the Solar Instructor Training Network.
Advanced Vehicle Technology Competitions (AVTCs)	11 (FY 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)		$28.9	Student Vehicle technology competitions, sponsored by DOE, partnered with American auto industry, and managed by Argonne National Laboratory (ANL) that provides hands-on, real-world experience in advanced vehicle technologies and designs. By engaging university students in advanced technology research and providing specialized training, these competitions help address workforce development needs for more highly trained engineers and support national efforts that encourage students to pursue careers in science, technology, engineering, and math.

Clean Cities University Workforce Development Program (CCUWDP)	4 (FY 2019, 2020, 2021, 2022)	EERE/(VTO) Vehicle Technologies Office	$4.4	The CCUWDP works in conjunction with the national network of nearly 100 Clean Cities Coalitions to host university students that are interested in careers related to the deployment of alternative and renewable fuels, idle-reduction measures, fuel economy improvements, and emerging transportation technologies.
Battery Workforce Initiative (BWI)	1 (FY 2022)	EERE/VTO & AMO	$5.0	The BWI is a DOE-led effort to support the development of a national workforce development system for the lithium battery manufacturing supply chain, by advancing workforce partnerships between industry and labor, and sponsoring pilot training programs in energy and automotive communities in transition. DOE is coordinating with DOL and the AFL-CIO, with the effort managed out of National Energy Technology Laboratory.
Collegiate Wind Competition (CWC)	9 (FY 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	EERE/(WETO) Wind Energy Technologies Office	$9.4	CWC helps college students prepare for jobs in the wind and renewable energy workforce through real-world experiences with wind energy technology, project development, finance, communications, and outreach.

University Program Development/Wind for Schools	10 (FY 2011, 2012, 2013, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	EERE/WETO	$5.7	Funding and technical assistance to develop university based educational programs, including pass through support to other educational institutions though university supported technical assistance to deploy wind turbines at K-12 schools. Facilitated through grants to academic institutions.
Wind Energy K-12 Programming	3 (FY 2020, 2021, 2022)	EERE/WETO	$.3	Funding and technical assistance to develop wind energy curricula, professional development, and challenges for K-12 teachers via organizations like KidWind and National Energy Education Development
Wind Energy University Engagement	8 (FY 2011, 2012, 2013, 2016, 2019, 2020, 2021, 2022)	EERE/WETO	$.9	Technical and financial support to university-focused wind energy engagement and programming. Work has supported strengthening university-based collaboration and research, including the North American Wind Energy Academy and the hosting of workshops for industry and educational institutions.
Wind Energy Workforce Analysis	6 (FY 2017, 2018, 2019, 2020, 2021, 2022)	EERE/WETO	$1.0	National scale research on wind energy workforce with a focus on industry needs, educational programs, and student articulation. Research focuses on developing a better understanding industry need related to skills, number of workers needed depending

				on different deployment scenarios, educational programs, and student articulation into the workforce, and defining the wind workforce gap, wind workforce experience, and creating the offshore wind workforce network.
Wind Workforce Industry Engagement	4 (FY 2019, 2020, 2021, 2022)	EERE/WETO	$1.1	Research indicates that industry continues to find difficulty in finding qualified applicants while potential workers indicate difficulty finding opportunities. Efforts seek to understand, strengthen, and communicate relationships and career pathways between industry, academia, professional associations, and NGO's that support wind-focused workforce development. Activities vary but include direct industry engagement, career mapping, workforce focused workshop, pavilions at industry conferences, and student articulation assessments.
Guidance for Home Energy Professionals (GHEP)	11 (FY 2011, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021)	EERE/Weatherization and Intergovernmental Programs (WIP)	$3.6	GHEP includes Standard Work Specifications (SWS), weatherization training center accreditation, and worker certifications

Hydropower Collegiate Competition	1 (FY 2022)	EERE/(WPTO) Water Power Technologies Office	$.5	Competitors of the Hydropower Collegiate Competition will design a concept to solve leading hydropower challenges, participate in the Connection Creation Contest and the Case Study Contest, and present their work at Waterpower Week in Spring 2023 or a similar industry event.
Marine Energy Collegiate Competition	4 (FY 2019, 2020, 2021, 2022)	EERE/WPTO	$2.6	The Marine Energy Collegiate Competition is designed to challenge interdisciplinary teams of undergraduate and graduate students to offer unique solutions to the burgeoning marine energy industry that can play a vital role in powering the blue economy.
Marine Energy Graduate Student Research Program	3 (FY 2020, 2021, 2022)	EERE/WPTO	$1.5	Marine Energy Graduate Student Research Program enables graduate students to conduct research at both their academic institution and at an external hosting facility carrying out research in marine energy (ME) and supporting the student's research plan. The hosting facility may be a government research facility, industry site (including but not limited to technology developers), university, or other facility approved by WPTO as a host facility.

Mickey Leland Energy Fellowship	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Office of Fossil Energy and Carbon Management (FECM)	$6.8	A 10-week summer research fellowship for undergraduate and graduate students in STEM majors. The mission is to strengthen a diverse pipeline of future STEM professionals. Participants train under the mentorship of scientists and engineers while completing a mission-focused research project.
National Science Bowl and Student outreach	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	FECM	$2.2	K-12 Activities such as the National Science Bowl and Student outreach for STEM education and awareness
The Historical Black Colleges and Universities (HBCU) and other minority institutions (OMI) education and training program	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2201, 2022)	FECM	$21.8	The HBCU and OMI education and training program awards research grants to HBCUs and OMIs which help upgrade research capabilities and emphasize longer-term research for achieving Fossil Energy's strategic objectives.

University Coal Research	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	FECM	$32.4	This funds colleges and universities to support early-stage research consistent with goals including advancing carbon dioxide removal, accelerating clean hydrogen, demonstrating and deploying point source carbon capture, and advancing critical minerals and rare earth elements, converting coal waste to products, and mine remediation. It provides a two-fold benefit: conducting directed energy research in an innovative environment and expanding the research capabilities of the next generation of scientists and engineers.
Whole Building Design Guide	1 (FY 2022)	Federal Energy Management Program (FEMP)	$.2	The National Institute of Building Science (NIBS) maintains and hosts accredited trainings on the Whole Building Design Guide. FEMP-funded trainings are aimed at Federal energy, water, and fleet management professionals, but the trainings are free and can be accessed by anyone.
Office of Indian Energy Policy and Programs (IE) college student internship program	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020,	IE & EERE/ Tribal Electrification Program (TEP)	$2.1	The Office of Indian Energy, with support and coordination from Sandia National Laboratories, offers a college student internship program for current full-time undergraduate and graduate students who are familiar with Native American culture and Tribal issues. Interns support Tribal energy

	2021, 2022)			projects and assist a cross-disciplinary team to perform specific technical tasks in the field and at DOE's Sandia National Laboratories.
Navigating Nuclear: Energizing Our World	2 (FY 2019, 2020)	Office of Nuclear Energy (NE)	$1.2	Navigating Nuclear: Energizing Our World was a dynamic, standards-aligned program that invited students to explore the many applications of nuclear science and its impact on energy, healthcare, food, and the environment through an interactive suite of free materials.
Nuclear Energy University Program (NEUP)	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NE	$570.5	Nuclear research and development technology support at university and colleges, provides hands-on experience in nuclear technologies and designs. By engaging university students in advanced nuclear technology research and providing specialized training, it addresses workforce development needs for more highly trained engineers and scientists to pursue careers in nuclear science, technology, and engineering.
Plutonium Pit Production Workforce Development Partnership	2 (FY 2021, 2022)	NE	$17.0	This funding went towards workforce development and training supporting plutonium pit production to minority-serving educational institutions. These projects seek to ensure a diverse pipeline of talented next-

				generation professionals who will help us meet our current and future pit production goals.
The Harnessed Atom	8 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2019)	NE	$3.0	The Harnessed Atom was a curriculum developed for middle school classrooms on nuclear energy. The kit included 30 student readers and a teacher's edition.
University Nuclear Leadership Program (UNLP), formerly the Integrated University Program (IUP)	11 (FY 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NE	$59.1	NE offers undergraduate scholarships and graduate fellowships to students pursuing nuclear energy-related disciplines under the (UNLP), formerly the (IUP). Relevant disciplines include nuclear engineering, chemistry, health physics, nuclear policy, radiation protection, physics. radiochemistry, materials science and engineering, electrical maintenance, nuclear operations, mechanical engineering, computer science, and cybersecurity.
Center of Excellence for Materials Degradation and Life Extension	1 (FY 2022)	NNSA	$3.3	This grant established a Center of Excellence in lifetime extension research and materials science. This collaboration between Case Western Reserve and our National Laboratories strengthened NNSA's capability to modernize

				manufacturing and production capabilities.
MSI Partnership Program (MSIPP) and Tribal Education Partnership Program (TEPP)	(FY 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)[62]	NNSA	$226.1	MSIPP develops strategic partnerships between MSIs, Tribal Colleges and Universities (TCUs), and the Nuclear Security Enterprise (NSE), investing in student enrichment programs, curriculum development, research efforts, and internship opportunities.
NNSA Graduate Fellow Program (NGFP) Fellowship	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NNSA	$84.5	NGFP Fellowship, managed by PNNL for the NNSA. Fellowships take place all over the country at NNSA locations and other DOE offices and interagency partners for graduate students and recent grads.
Nuclear Nonproliferation International Safeguards (NNIS) Graduate Fellowship Program	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NNSA	$6.6	The NNIS Graduate Fellowship Program provides financial support for exceptional students pursuing technical doctoral research relevant to the field of international safeguards. Participating universities foster partnerships between science/engineering programs and programs focused on nuclear nonproliferation and safeguards policy. Armed

				with both deep technical expertise and policy understanding, NNIS Fellows are primed to take on the exciting and challenging work of international nuclear safeguards.
Predictive Science Academic Alliance Program (PSAAP)	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NNSA	$199.8	Funded PSAAP Centers to support research performed at leading U.S. institutions of higher learning to develop and demonstrate technologies and methodologies to support effective, high-performance computing in the context of science and engineering applications.
Rickover Fellowship Program (RFP)	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NNSA	$11.6	This program is designed to meet the needs of the Naval Reactors Division at DOE for doctoral level employees for the development of science and engineering technology as it pertains to naval nuclear propulsion. The program will assist in preparing students for roles in naval nuclear propulsion and will support the broader objective of advancing fission energy development through the research efforts of the Fellows. The technical areas with greatest interest include reactor physics, nuclear materials science and engineering, radiation shielding technology, thermal hydraulics, computational fluid dynamics, acoustic

				technology, machine learning, and artificial intelligence technology.
Stewardship Science Academic Alliance (including SSAA Centers of Excellence, SSGF, and LRGF)	8 (FY 2015, 2016, 1207, 2018, 2019, 2020, 2021, 2022)[63]	NNSA	$243.4	Dedicated funding for the Stewardship Science Academic Alliance (including SSAA Centers of Excellence, SSGF, and LRGF) to support scientific research in areas crucial to the stockpile stewardship program and support hands on training for graduate students in areas relevant to stockpile stewardship.
University Consortia for Nuclear Nonproliferation	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NNSA	$150.0	The mission is to train the next generation of nuclear scientists and engineers, while engaging in R&D spanning basic aspects of new technology and methods to programmatic work directly supporting the NNSA's nuclear security and nonproliferation missions.
Workforce Opportunities in Regional Careers II	3 (FY 2020, 2021, 2022)	NNSA	$3.0	This includes efforts to enhance NNSA's growing workforce associated with NNSA missions, pilot a project to place mentors in local middle schools and establish a program that focuses on student scholarships and recruitment at South Carolina HBCUs.

Workforce Opportunities in Regional Careers (WORC)	7 (FY 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NNSA and Office of Environmental Management (EM)	$2.9	The Savannah River Site Community Reuse Organization has a grant in place to further WORC initiative. The grant is supporting a workforce sustainability program and includes a nuclear workforce marketing and outreach plan, scholarships in key programs and development of workplace learning experiences.
Joint Program in High Energy Density Laboratory Plasmas (JPHEDLP)	9 (FY 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	NNSA and Office of Science (SC)	$74.6	Funding for JPHEDLP to support opportunities for national collaboration in HED Science and maintain a strong HED community critical to the future needs of the modern stockpile.
Center for Ultra-wide Area Resilient Electric Energy Transmission Networks (CURENT)	10 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020)	Office of Electricity (OE)	$21.0	CURENT was a collaboration between academia, industry, and National Laboratories. CURENT develops and demonstrates advanced grid applications and tools to enhance grid reliability and economics. The research involved data collection/processing, analysis, visualization, monitoring and alarming, and decision support for grid operators. Many of the applications relied on high time-resolution and time-synchronized grid monitoring technologies.

Transmission, Reliability, and Resilience (TRR)	1 (FY 2022)	OE	$.5	In collaboration with NSF, DOE invested in undergraduates through the Research Experiences for Undergraduates (REU) Program, as well as Non-academic graduate student internships for power systems through the NSF's INTERN Program to support workforce development in power systems and data analytics to support the reliability, resilience, security and efficiency of the electric power grid.
Energy I-Corps	7 (FY 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Office of Technology Transitions (OTT)	$1.31*	Energy I-Corps pairs teams of researchers with industry mentors for an intensive two-month training in which the researchers define technology value propositions, conduct customer discovery interviews, and develop viable market pathways for their technologies. Researchers return to the lab with a framework for industry engagement to guide future research and inform a culture of market awareness within the labs
Energy Technology University Prize	1 (FY 2022)	OTT	$1.35*	EnergyTech UP aims to cultivate the next generation of energy innovators while accelerating the transfer of energy technologies to market. This prize seeks to attract the talented students

* Note: *This data is not reflected in the figures or tables of this report as the funding levels for these three programs overseen by the Office of Technology Transitions are partial and as such are only reflected in the data appendix.*

				of today and help them develop into the engineers, policymakers, entrepreneurs, market analysts, and project developers of tomorrow. Multidisciplinary student teams develop and present a business plan that leverages National Laboratory-developed or other high-potential energy technologies, including university-developed technologies or other technologies of interest to student competitors.
Technology Commercialization Internship Program	2 (FY 2021, 2022)	OTT	$.3*	The internship is a unique, paid opportunity for undergraduate STEM and business students to experience the DOE world-class National Laboratory system, boost their entrepreneurial thinking, and explore energy technology markets.
Weatherization Assistance Program (WAP)	11 (FY 2011, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021)	Office of State and Community Energy Programs (SCEP)	$13.5	Grantee level funds focused on worker training and certification.

Reaching a New Energy Sciences Workforce (RENEW) Initiative	1 (FY 2022)	Science/All Programs	$4.0	This initiative specifically targets increased outreach to and participation of undergraduate and graduate students from MSIs and individuals historically underrepresented in STEM in SC-sponsored research. It will include research traineeships and internships at DOE's National Laboratories, coupled to pursuit of a STEM degree in areas critical to the SC mission. These research or technical training experiences would prepare future scientists, technicians, and professionals to support DOE mission needs.
Computational Science Graduate Fellowship (CSGF)	10 (FY 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Science/ASCR (Advanced Scientific Computing Research)	$92.8	This fellowship, which is jointly funded by the DOE's Office of Science and the DOE's NN SA, requires that graduate students plan and follow a course of study that transcends the bounds of traditional academic disciplines. It requires substantive graduate work in each of a scientific or engineering discipline, and generally includes computer science and applied mathematics, as well as a practicum at one of the DOE National Laboratories. Fellows are mentored to become scientists and engineers who can comfortably communicate across several scientific and technological disciplines.

Research Alliance in Math and Science Program (ASCR-ORNL RAMS Program	1 (FY 2011)	Science/ASCR	$.3	This program provided collaborative research experience opportunities for faculty and students at colleges or universities by pairing them with DOE National Laboratory researchers. The linkage of academic and lab personnel served to expand the DOE's workforce quality and diversity in science and technology important to the Nation. Such research experience enriched the U.S. scientific and technological base and broadens the pool of qualified applicants for DOE computational positions.
ARM Climate Research Facility Education and Outreach Program	1 (FY 2011)	Science/BER (Biological and Environmental Research)	$.3	This provided climate change educational outreach in the communities and regions hosting the ARM Program's data-gathering field sites: the Southern Great Plains (SGP) of the U.S., the Tropical Western Pacific (TWP), and the North Slope of Alaska (NSA). The goal of the education and outreach program was to develop basic science awareness and increase critical thinking skills focusing on environmental science and climate change for K-12 students. Almost all the materials are useful for students anywhere and are available on the web.

Global Change Education Program (GCEP)	1 (FY 2011)	Science/BER	$1.4	GCEP had two components: the Summer Undergraduate Research Experience (SURE) and the Graduate Research Environmental Fellowships (GREF). SURE's primary goal was to involve undergraduate students at the end of their sophomore or junior year in BER-supported global change research, then continue this experience during subsequent undergraduate summers. To further improve the quality of emerging scientists in disciplines related to global climate change research, SURE students are encouraged to apply for GREF graduate fellowships and to pursue graduate education opportunities.
Marine Biological Laboratory Summer Course	4 (FY 2014, 2015, 2016, 2019)	Science/BER	$.3	Marine Biological Laboratory Summer Course at Woods Hole, Massachusetts. A 6-week summer laboratory course designed for established investigators and graduate students to introduce them to methodologies and concepts in the molecular, biochemical, and physiological basis of prokaryotic microbial diversity.

Radiochemist Fellowship	1 (FY 2011)	Science/BER	<$0.1	Trainees spent 9 months rotating as interns through facilities at UC Berkeley, UC San Francisco, and Lawrence Berkeley National Lab (LBNL) as part of their training to become the next generation of radiochemists. It included a 3-month rotation at LBNL where students learned about solid target development, automation, and small molecule radiochemical labeling techniques.
National Nuclear Chemistry Summer School (NNCSS)	11 (FY 2011, 2012, 2013, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Science/BER, BES, IRP and NP	$6.0	DOE has a long-term commitment to the development of nuclear energy in the U.S. An important element of this commitment is to support training in radiochemistry and nuclear chemistry. This program is an intensive 6-week summer training in aspects of nuclear and radiochemistry for students who are in college toward the end of their undergraduate programs, when they are formulating career plans.
Graduate Course for Interdisciplinary Consortium for Research and Educational Access in Science and Engineering (InCREASE) Institutions	3 (FY 2020, 2021, 2022)	Science/BES (Basic Energy Sciences)	<$0.1	The Graduate Course for Interdisciplinary Consortium for Research and Educational Access in Science and Engineering (InCREASE) Institutions is organized by both NSLS-II and CFN staff (supported by NSLS-II and CFN). There are 15 institutions participating (not all institutions are minority serving

				institutions), some of which grant 3 graduate level credits for the course.
Linac Coherent Light Source (LCLS) Internship	4 (FY 2019, 2020, 2021, 2022)	Science/BES	$2.0	The LCLS has a well-established, paid 10-week summer internship program for undergraduate and graduate students. The program is mainly supported by the facility research program in collaboration with university professors. The goal is promoting X-ray science and train potential next generation users.
National School on Neutron and X-ray Scattering	7 (FY 2011, 2014, 2015, 2016, 2017, 2020, 2022)	Science/BES	$1.7	The National School on Neutron and X-ray Scattering jointly conducted annually by ANL and Oak Ridge National Laboratory (ORNL) focuses on the introduction of graduate students (~60 each year) to X-ray and Neutron scattering techniques for materials research. Each year students spend one week at either ANL or ORNL followed by another week at the other site to learn about the capabilities at both the X-ray and neutron scattering facilities available at these labs.
SC Workforce Program	1 (FY 2019)	Science/BES	<$0.1	This was a one-day workshop for graduate students and postdocs that highlighted the contributions physics-related research can make towards meeting the nation's energy needs in environmentally friendly ways. The workshop

				featured plenary talks by leaders in the field of energy research. After an overview talk, there were talks on different cutting-edge research areas.
SC Workforce Program	1 (FY 2022)	Science/BES	<$0.1	This is a one-day workshop for graduate students and postdocs that highlights the contributions physics-related research can make towards meeting the nation's energy needs in environmentally friendly ways. The workshop features plenary talks by leaders in the field of energy research. After an overview talk, there are talks on different cutting-edge research areas.
SC Workforce Program	1 (FY 2011)	Science/BES	<$0.1	Short Courses at these professional society meetings were 2-4 days in length and were in-depth reviews of a broad topic. One to three short courses per year were supported for undergraduates, graduates, and early career professionals in emerging science areas related to geosciences, and especially focused on DOE geosciences interests.
SC Workforce Program	1 (FY 2011)	Science/BES	<$0.1	This program sought to communicate possibilities for STEM-field careers, and to encourage minority participation and applications for ANL's medium energy and nuclear physics research positions. This program supported about 20-30 visits to

				selected colleges and universities by Argonne staff to provide information about Argonne programs and opportunities. The visits were directed at minority science students, mainly undergraduate, as well as graduate, through involvement of faculty. NP provides direct support to ANL for enhancement of minority participation in physics research including support of a program for minority faculty and faculty from HBCUs.
Ultrafast X-ray Summer School	8 (FY 2011, 2014, 2016, 2017, 2018, 2019, 2020, 2022)	Science/BES	$.2	This is a five-day residential program held in alternate years in California (PULSE) and Germany (DESY). The goal is to disseminate information and train students and post-doc on new opportunities in ultrafast science, particularly using X-ray Free Electron Lasers.
NSF/DOE Quantum Science Summer School	2 (FY 2019, 2022)	Science/BES and ASCR	$.2	The NSF/DOE Quantum Science Summer School is a program dedicated to the education of graduate students and postdocs in the fields of condensed matter physics, materials science, and disciplines of quantum science in engineering, chemistry, and related fields. The annual summer school focuses on key topics of interest in quantum science and their applications to new technologies in

				academic and industrial contexts.
SAGE	1 (FY 2011)	Science/BES and BER	<$0.1	SAGE is an immersion course in geophysics that was funded jointly by BER-ERSD and BES-Geosciences Research program. This educational program was designed to introduce students in geophysics and related fields to "hands on" geophysical exploration and research. The program emphasizes both teaching of field methods and research related to a variety of basic and applied problems.
APS Conferences for Undergraduate Women in Physics (CUWiP)	4 (FY 2011, 2019, 2020, 2021)	Science/BES, NP, HEP, and FES	$.8	APS CUWiP are three-day regional conferences for undergraduate physics majors. The goal is to help undergraduate women continue in physics by providing them with the opportunity to experience a professional conference, information about graduate school and professions in physics, and access to other women in physics of all ages with whom they can share experiences, advice, and ideas.
Fusion Energy Sciences (FES) Workforce Program	1 (FY 2011)	Science/FES	<$0.1	This program brought physics demonstrations to K-12 level students around the state of Wisconsin and elsewhere. For twenty years, the University of Wisconsin

				has had a fast-paced lecture/demonstration program reaching over 2,000 members of the public in its annual shows, with many thousands more in it across the country (e.g., traveling shows). The presentations were designed to excite students about science in general, specifically plasma physics.
FES Workforce Program	1 (FY 2011)	Science/FES	$.2	Since 1990, Princeton Plasma Physics Laboratory (PPPL) and the Trenton Public Schools partnered to provide a framework for systemic reform in math, science, and technology education in this district. A key objective was to expand K-12 teachers' knowledge of science and math concepts, and to assist them in presenting material in a way that engages students. DOE supported scientists and engineers who serve as science advisors in the schools, classroom visits by scientists and engineers, and laboratory research experiences for students and teachers. Included high school student research internships and teacher workshops.
FES Workforce Program	1 (FY 2011)	Science/FES	$.2	This program supported grades 4-12 teacher education in physical sciences and mathematics through workshops and classroom presentations. The program also offered

				supplemental material on plasma science and fusion technology in a variety of media formats, and uses demos and activities designed to nurture interest in STEM associated careers.
FES Workforce Program	1 (FY 2011)	Science/FES	$.2	This program leveraged the unique K-12 partnership between LLNL and the University of California, Davis - Edward Teller Education Center. Funds provided high school teachers the ability to attend professional development workshops to enhance their classroom teaching skills in plasma physics and fusion. The lessons and activities supported are linked to the California State Education Standards and teachers can earn undergraduate and master's degree credit for participation in the program.
FES Workforce Program	1 (FY 2011)	Science/FES	$.2	This project was an intensive summer development program for high school physics teachers and middle school science teachers. The purpose was to increase teachers' content knowledge in areas of plasma science and to increase their capacity to incorporate demonstrations, labs, and advanced projects into existing classes. The project included development of materials for workshops on fusion and plasma science for general use by high school and middle school

				teachers during their teaching activities.
Fusion Energy Sciences (FES) Fellowship Program	1 (FY 2011)	Science/FES	$.6	This program was administered for DOE by the Oak Ridge Institute for Science and Education (ORISE), operated by Oak Ridge Associated Universities (ORAU). Fellowships are awarded for one-year renewable terms in support of full-time graduate study and thesis research within the United States. Study and research under the fellowship was conducted in the field of fusion energy sciences and technology related to the development of fusion energy.
General Atomics (GA)	1 (FY 2022)	Science/FES	$.2	GA provided outreach opportunities for students and the public through hosting DIII-D Facility tours and participating in the San Diego Festival of Science and Engineering, APS/DPP Teachers Day and student Plasma Expo, as well as specifically offering young female students opportunities for interacting with female scientists through the Expanding Your Horizons (EYH) and Better Educated Women in Science

				& Engineering (BE WiSE) programs.
High Energy Density Laboratory Plasmas	6 (FY 2012, 2013, 2018, 2019, 2021, 2022)	Science/FES	$1.3	A week-long summer school consisting of mini courses in a few topical areas. It is open to graduate students researching plasma related topics from a broad range of fields: magnetic fusion energy sciences, HED plasmas, astrophysics, low temperature plasmas, materials science, etc.
Modeling, Experimentation and Validation (MeV) summer school	4 (FY 2012, 2013, 2019, 2022)	Science/FES	$.7	Founded in 2009, the Modeling, Experimentation and Validation (MeV) summer school is a two-week course for graduate students and early career nuclear engineers and scientists that integrates modeling, experimentation, and validation of nuclear fission and fusion energy systems. The school is intended to educate the next generation of researchers on the critical challenges faced by the nuclear fission and fusion energy development.
National Undergraduate Fellowship Program in Plasma Physics and Fusion Energy Sciences	1 (FY 2011)	Science/FES	$.4	This provided outstanding undergraduates with an opportunity to conduct research in disciplines that generally comprise plasma sciences with an emphasis on fusion research. The goal of the program was to stimulate students' interest

				in the fields relevant to fusion research, and to provide capable assistance in, and gain experience with, fusion research projects. In order for students to obtain a sufficient background to begin their research projects, the nine-week project was preceded by a one-week introductory course at the Princeton Plasma Physics Laboratory in the basic elements of plasma physics, after which the students travel to the sites of their research projects.
Plasma and Fusion Undergraduate Research Opportunities (PFURO) Internship	2 (FY 2021, 2022)	Science/FES	$.2	PFURO internship is 10 weeks of remote summer research under the guidance of faculty and staff at U.S. undergraduate institutions (universities, colleges, and other educational research institutions). Participants must be currently enrolled as a full-time undergraduate student at an accredited US institution OR Applicants who will complete their undergraduate degree prior to starting their internship may apply as a "Graduating Senior," if (1) the applicant has not yet started a program of graduate study and will not matriculate as a graduate student prior to completing the PFURO term, and (2) the time period between receipt of an undergraduate degree and

				starting the PFURO term is less than two years.
DOE/INFN Summer Exchange Program	1 (FY 2011)	Science/HEP	<$0.1	U.S. graduate students are hosted at National Institute of Nuclear Physics (INFN) research centers in Italy. In return, the U.S. provides funding for Italian graduate students to spend a summer working on high energy physics research at either Fermilab or SLAC National Accelerator Laboratory (SLAC). Because high energy physics experiments are international endeavors, the expected outcomes of this exchange program were to increase international cooperation and to provide additional opportunities for study that are otherwise not available.
HEP Workforce Funding	1 (FY 2011)	Science/HEP	<$0.1	This conference series was funded by HEP through Yale University. The targeted group was female undergraduate physics students. The conference program included research talks by faculty, panel discussions about graduate school and careers in physics, presentations, and discussions about women in physics, laboratory tours, student research talks, and a student poster session. The outcome was to engage and retain young women in the

				advancement of high energy physics, a field in which they have historically been underrepresented.
International Accelerator School for Linear Colliders	1 (FY 2011)	Science/HEP	<$0.1	Fermilab managed the International Accelerator School for Linear Colliders, although the location of the school varied from year to year (the first year was held in Japan, the second in Italy, and the third in the U.S.). Both graduate students and post-doctoral researchers were accepted. Course work covered all aspects of accelerator physics as they apply to linear colliders. The expected outcome was to develop and maintain working accelerator physicists who understand the unique requirements of linear colliders as they apply to high energy physics research.
QuarkNet	3 (FY 2011, 2012, 2013)	Science/HEP	$2.0	QuarkNet was a joint National Science Foundation and DOE program that partnered high school physics teachers with researchers at universities and National Laboratories across the country who work in the field of high energy physics. These teachers participated in the analysis of data and bring this experience to their classrooms. Each QuarkNet center was established at a university or National

				Laboratory with full operating mode being 12 high school teachers.
Particle Accelerator School	11 (FY 2011, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Science/HEP and BES	$7.9	The Particle Accelerator School (funded by only HEP in FY 11 and 21 and HEP and BES in all other years) is a national workforce development and training program in the field of particle beams and their associated accelerator technologies. Run by Fermilab, the school's coursework is targeted for undergraduate and graduate students who wish to study accelerator physics, but relevant courses are not available in their home institutions, as well as postdocs and DOE National Laboratory staff who need to further develop their training and skill sets.
Exotic Beam Physics	8 (FY 2011, 2014, 2015, 2016, 2018, 2019, 2021, 2022)	Science/NP (Nuclear Physics)	$.2	This training program on Exotic Beam Physics (formerly the Rare Isotope Accelerator (RIA) Summer School) provides a week-long, intensive, hands-on experience for mainly graduate students in research with radioactive ion beams.

HUGS (Hampton University Graduate Studies Program)	7 (FY2011, 2014, 2015, 2016, 2018, 2020, 2022)	Science/NP	$.6	The three-week training program provides graduate level instruction and training on nuclear physics research related to Thomas Jefferson National Accelerator Facility. Hampton University, an HBCU, emphasizes serving under-represented students.
SC Workforce Program	1 (FY 2011)	Science/NP	$.1	Each year a different topic in materials science was selected for the training of students. The school curriculum included fundamentals of neutron scattering, focused seminars on the selected topic, experimental techniques, data reduction and analysis, as well as hands-on training using the instruments at the Lujan Center at the Los Alamos Neutron Center (LANSCE). It was intended for graduate students and postdocs working in materials science research with interest in applying neutron scattering. Its duration was ten days.
Albert Einstein Distinguished Educator Fellowship	10 (FY 2011, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Science/WDTS	$11.8	The Albert Einstein Distinguished Educator Fellowship Act of 1994 charges DOE with administering a fellowship program for elementary and secondary school mathematics and science teachers that focuses on bringing teachers' real-world expertise to government to help inform Federal STEM education programs. Selected teachers spend 11

				months in a Federal agency or a Congressional office.
Community College Internship (CCI)	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Science/WDTS	$13.2	CCI places community college students as paid interns in technological activities at DOE laboratories, working under the supervision of a laboratory technician or researcher mentor. CCI provides dedicated technical training for community college students who are interested in technical careers and provides a pathway for those who plan to pursue further educational objectives beyond community college.
DOE ACTs	1 (FY 2011)	Science/WDTS	$4.2	DOE ACTs required a three-year commitment by educators to participate in this program focused on teacher professional development. Each participant spends an intensive four to eight weeks annually at DOE National Laboratories working under the mentorship of master educators and laboratory scientists to build content knowledge, research skills, and a lasting connection with the scientific community through the research experience.

Faculty and Student Teams (FaST) summer internship/fellowship	1 (FY 2011)	Science/WDTS	$1.2	An opportunity for faculty from colleges and universities with limited prior research capabilities, and those institutions serving women or minorities, to participate with up to three of their undergraduate students in a mentor intensive science research project at one of six DOE National Laboratories. Over a 10-week summer visit to the laboratory, the faculty member was introduced to new and advanced scientific techniques that contribute to their professional development and help them prepare their students for careers in science, engineering, computer sciences, and technology.
High School Engineering	1 (FY 2011)	Science/WDTS	$.4	High School Engineering provided students, grade 9-12, the opportunity to work on real world engineering challenges in a team environment. Students utilized professional engineering software to develop solutions and prepare presentations that convincingly demonstrate the value of their solutions.
National Science Bowl	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018,	Science/WDTS	$33.6	The DOE National Science Bowl® is a nationwide academic competition testing students' knowledge in all areas of mathematics and science, including energy. High school and middle school students are quizzed in a fast-paced,

	2019, 2020, 2021, 2022)			question-and-answer format. Approximately 320,000 students have participated in the National Science Bowl® throughout its 31-year history, and it is one of the Nation's largest science competitions.
Pre-Service Teachers (PST) activity	1 (FY 2011)	Science/WDTS	$.5	The PST activity was for students preparing for a teaching career in a Science, Technology, Engineering, and Mathematics (STEM) discipline. This effort addressed the need to improve the content knowledge of STEM teachers prior to entering the teaching workforce. The NSF began a collaboration with DOE on this activity in 2001. This allowed NSF's undergraduate pre-service programs to include a PST internship in the opportunities they provide to students.
Science Graduate Student Research (SCGSR)	11 (FY20 1202, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Science/WDTS	$46.3	SCGSR's goal is to prepare graduate students for STEM careers critically important to the SC mission by providing graduate thesis research opportunities at DOE laboratories. The program provides supplemental awards for graduate students to pursue part of their graduate thesis research at a DOE laboratory or facility in areas that address scientific challenges central to the SC mission. U.S. graduate students pursuing Ph.D. degrees in

				physics, chemistry, materials sciences, non-medical biology, mathematics, computer or computational sciences, or specific areas of environmental sciences aligned with the SC mission, are eligible for research awards to conduct part of their graduate thesis research at a laboratory or facility in collaboration with a DOE scientist.
SULI	12 (FY 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Science/WDTS	$110.7	SULI places students from two- and four-year undergraduate institutions as paid interns in science and engineering research activities at DOE laboratories, working with laboratory staff scientist and engineer mentors on projects related to ongoing research programs. Appointments are for ten weeks during the summer term and 16 weeks during the fall and spring terms.
Visiting Faculty Program (VFP)	11 (FY 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022)	Science/WDTS	$18.3	The goal is to increase the research competitiveness of faculty members and students at U.S. institutions of higher education historically underrepresented in the research community, including Minority Serving Institutions (MSIs). Through direct collaboration with research staff at DOE host laboratories, VFP appointments provide an opportunity for faculty and their students to develop

				skills applicable to programs at their home institutions. VFP helps increase the STEM workforce in DOE science mission areas at institutions historically underrepresented.
Office of Science Graduate Fellowship program	1 (FY 2011)	Science/WDTS and ASCR	$23.0	This fellowship required that graduate students plan and follow a course of study that transcends the bounds of traditional academic disciplines. It required substantive graduate work in each of a scientific or engineering discipline, and generally includes computer science and applied mathematics, as well as a practicum at one of the DOE National Laboratories. Fellows in this program were mentored to become scientists and engineers who can comfortably communicate across several scientific and technological disciplines.

[1] CoSTEM's formation was directed by the America COMPETES Reauthorization Act of 2010, P.L. 111–358, and established in 2011. The purpose of the CoSTEM is to coordinate Federal programs and activities in support of STEM education. More information is available here: https://obamawhitehouse.archives.gov/administration/eop/ostp/nstc/committees/costem.

[2] Energy Futures Initiative's January 2023 report—one of several outside reports projecting job growth from new policies, all of which come to similar conclusions—forecasts new job creation impacts of the Inflation Reduction Act (IRA) by 2030. The study projects nearly $1.5M net new energy sector jobs added from IRA (relative to business-as-usual) by 2030. This includes 590,000 net new construction jobs, 190,000 net new jobs in power sector, and 150,000 net new manufacturing jobs (including 45,000 in vehicle manufacturing and 61,000 battery manufacturing). https://energyfuturesinitiative.org/reports/jobs-emissions-and-economic-growth-what-the-inflation-reduction-act-means-for-working-families-jobs-emissions-and-economic-growth/.

[3] See Executive Order 14008, "Tackling the Climate Crisis at Home and Abroad," January 27, 2021. https://www.energy.gov/sites/default/files/2021/02/f83/eo-14008-tackling-climate-crisis-home-abroad.pdf

[4]See more information about the 21st Century Energy Workforce Advisory Board here: https://www.energy.gov/policy/members-21st-century-workforce-advisory-board-ewab .
[5] See full report here: https://www.congress.gov/congressional-report/116th-congress/house-report/83/1.
[6] See full report here: https://www.congress.gov/congressional-report/117th-congress/house-report/394/1.
[7] See full report here: https://www.appropriations.senate.gov/download/ewfy23rpt.
[8] See full report here: https://www.appropriations.senate.gov/download/division-d_-energy-and-water-statement-fy23.
[9]Responses were gathered from the Offices of Cybersecurity, Energy Security, and Emergency Response; Electricity; Energy Efficiency and Renewable Energy (/Advanced Manufacturing Office, /Bioenergy Technologies Office, /Building Technologies Office, /Geothermal Technologies Office, /Hydrogen and Fuel Cell Technologies Office, /Solar Energy Technologies Office, /Tribal Energy Program, /Vehicle Technology Office, /Wind Energy Technology Office, /Weatherization and Intergovernmental Programs, /Water Power Technologies Office); Fossil Energy and Carbon Management; Federal Energy Management Programs; Indian Energy; Nuclear Energy; and Science (/Advanced Scientific Computing Research, /Biological and Environmental Research, /Basic Energy Science, /Fusion Energy Sciences, /High Energy Physics, /Isotope R&D and Production, /Isotopes, /Nuclear Physics, /Workforce Development for Teachers and Scientists); and the National Nuclear Security Administration.
[10]CoSTEM's formation was directed by the America COMPETES Reauthorization Act of 2010 and established in 2011. The purpose of the CoSTEM is to coordinate Federal programs and activities in support of STEM education. More information is available here: https://obamawhitehouse.archives.gov/administration/eop/ostp/nstc/committees/costem.
[11]See DOE," Brief History of the Department of Energy," Office of Legacy Management. A Brief History of the Department of Energy | Department of Energy.
[12]See more information about the jobs created by the Inflation Reducation act here: https://www.bluegreenalliance.org/resources/the-inflation-reduction-act-at-one-year/.
[13]See more information about the Office of Science's Community College Internship (CCI) program here: https://science.osti.gov/wdts/cci.
[14]See more information about the NNSA's Stewardship Science Academic Alliances (SSAA) programs here: https://www.nnsa-ap.us/Programs/Stewardship-Science-Academic-Alliances.
[15]See more information about the U.S. Particle Accelerator School (USPAS) here: https://uspas.fnal.gov/.
[16]An intensive 6-week summer program that was jointly funded by BES-Heavy Element Chemistry and NP-Low Energy supported training in radiochemistry and nuclear chemistry for students who are in college toward the end of their undergraduate programs, when they are formulating career plans.
[17]This includes funding for Argonne National Lab's Exotic Beam Summer School which provides intensive hands-on experience for physics graduate students: https://www.anl.gov/education/exotic-beam-summer-school.
[18]See more information about "The Harnessed Atom" middle school curriculum here: https://www.energy.gov/ne/downloads/harnessed-atom-student-edition.
[19]See more information about the Exotic Beam Summer School here: https://www.anl.gov/education/exotic-beam-summer-school.
[20]See more information about the NNSA-funded Workforce Opportunities in Regional Careers (WORC) program here: https://www.atc.edu/WORC.
[21]This includes Tribal Colleges and Universities.
[22]See more information about the WDTS here: https://science.osti.gov/wdts.
[23]See more information about the Computational Science Graduate Fellowship here: https://science.osti.gov/ascr/CSGF.
[24]See the Industrial Assessment Center projects here: https://www.energy.gov/eere/amo/industrial-assessment-centers-iacs. This program is expanding to community college and union training programs.
[25]See more information about the Fossil Energy and Carbon Management Office's University Coal Research program: https://www.energy.gov/fecm/science-innovation/clean-coal-research/crosscutting-research/university-coal-research.

[26]See the Solar Decathlon Professionals Program: https://www.solardecathlon.gov/sdpro.html.
[27]Building Coach is the online continuing education platform: https://www.building-coach.org/.
[28]See EERE's "Training the Next Generation of Heat Pump HVAC Technicians" https://www.energy.gov/eere/buildings/articles/training-next-generation-heat-pump-hvac-technicians.
[29]See more information about the Better Buildings Workforce Accelerator here: https://betterbuildingssolutioncenter.energy.gov/accelerators/workforce.
[30]See information about the "Solar Instructor's Training Network" https://www.energy.gov/eere/solar/solar-training-network.
[31]See Elevate Energy, "SunShot STEP Award Will Help Real Estate Agents and Appraisers Value Home Solar Systems," May 17, 2016. https://www.elevatenp.org/real-estate/sunshot-award-to-value-home-solar-systems/.
[32] See the Building Technology Office's Next Generation Energy Training https://www.energy.gov/eere/buildings/articles/next-generation-energy-training.
[33]See EERE's press announcement: https://www.energy.gov/eere/articles/energy-department-awards-6-million-develop-training-programs-professionals-working-new.
[34]See more information about the Collegiate Wind Competition here: https://www.energy.gov/eere/collegiatewindcompetition/collegiate-wind-competition.
[35]See full details of this Building Technology Office program here: https://www.energy.gov/eere/buildings/articles/educational-consortium-energy-related-data-science-computation-building.
[36]See more information here: https://www.energy.gov/eere/fuelcells/articles/apply-funding-train-next-generation-hydrogen-workforce.
[37]See full description of the National Laboratories here: https://www.energy.gov/national-laboratories.
[38]See the Bioenergy Technologies Office's AlgaePrize: https://www.energy.gov/eere/bioenergy/algaeprize-competition.
[39]See the Office of Indian Energy's overview of their Student Intern research papers here: https://www.energy.gov/indianenergy/recent-college-student-intern-research-papers.
[40]See more information about the APS Conference for Undergraduate Women in Physics here: https://www.aps.org/programs/women/cuwip/index.cfm.
[41]Community Based Organizations are those that are located within the community they are benefitting.
[42]In FY 2022, more than 2,700 middle school students (from 504 schools) and 5,200 high school students (from 941 schools) participated in 108 regional competitions, with 46 middle school teams and 62 high school teams advancing to the virtual National Semi-Finals in May 2021. Forty-nine U.S. States, the District of Columbia, and Puerto Rico were represented at regionals. See more information about the Office of Science's annual National Science Bowl here: https://science.osti.gov/wdts/nsb.
[43]See more information about the SunSpec Alliance here: https://sunspec.org/education/.
[44]See more information about NNSA's "Navigating Nuclear: Energizing Our World" curriculum project here: https://www.ans.org/nuclear/navigatingnuclear/.
[45]See more information about the Hampton University Graduate Studies Program (HUGS) program here: jlab.org/education/hugs.
[46]See more information about this collaboration between DOE's Building Technology Office and the Alaska Housing Finance Corporation here: https://www.ahfc.us/events/building_monitoring_bmon_training-3.
[47]See more about the Office of Science Graduate Student Research (SCGSR) Program here: https://science.osti.gov/wdts/scgsr.
[48]See more information about Ultrafast science here: https://www.energy.gov/science/doe-explainsultrafast-science.
[49]See more information about the annual Ultrafast X-Ray Summer School here: https://web.stanford.edu/group/pulse_institute/uxss2022/.
[50]See more information about NNSA's Minority Serving Institutions Internship Program (NNSA-MSIIP) here: https://orise.orau.gov/NNSA-MSIIP/.

[51]See more information about the Flexible Load Adaptation Training (FLAT) for Energy Service Professionals here: https://www.energy.gov/eere/buildings/articles/flexible-load-adaptation-training-flat-energy-services-professionals.
[52]See more information about the Clean Energy States Alliance project here: https://www.energy.gov/eere/solar/project-profile-clean-energy-states-alliance.
[53]See more information about these NNSA initiatives here: https://www.nnsa-ap.us/Programs/Stewardship-Science-Academic-Alliances.
[54]More information about the Office of Science's Visiting Faculty Program (VFP) can be found here: https://science.osti.gov/wdts/vfp.
[55]See more information about the Science Undergraduate Laboratory Internships (SULI) here: https://science.osti.gov/wdts/suli.
[56]See more information about the Plasma and Fusion Undergraduate Research Opportunities (PFURO) internships here: https://www.pppl.gov/plasma-and-fusion-undergraduate-research-opportunities-pfuro.
[57]See more information about the Industrial Assessment Centers and the funding to expand their reach here: https://www.energy.gov/mesc/industrial-assessment-centers-iacs.
[58]The mission, spearheaded by NNSA, includes maintaining the U.S.'s nuclear stockpile; preventing nuclear weapon proliferation and reducing the threat of nuclear and radiological terrorism around the world; preventing, countering, and responding to a terrorist or other adversary with a nuclear or radiological device; and providing militarily effective nuclear propulsion plants and ensures their safe, reliable and long-lived operation see: https://www.energy.gov/nnsa/missions.
[59]https://dodstem-assets.dodstem.us/files/Final_2022_CoSTEM_Progress_Report.pdf
[60]See the full DOL-DOE Memorandum of Understanding here: https://www.dol.gov/sites/dolgov/files/OPA/newsreleases/2022/06/OSEC%20DOE%20MOU.pdf.
[61]The scope of the EWAB's recommendations was laid out by Congress in the Bipartisan Infrastructure Law: https://uscode.house.gov/view.xhtml?hl=false&edition=prelim&req=granuleid%3AUSC-prelim-title42-chapter162-subchapter2&f=treesort&num=0&saved=%7CNDI%3D%7CdHJlZXNvcnQ%3D%7CdHJ1ZQ%3D%3D%7C14551%7Ctrue%7Cprelim.
[62] MSIPP was developed in FY12/13, but FY14 was the first year of a dedicated budget line.
[63] SSAA existed in FY 11-14, it was not a budget line item at that time.