

## Workforce Development for Teachers and Scientists

### Overview

The Workforce Development for Teachers and Scientists (WDTS) program mission is to help ensure that DOE has a sustained pipeline of science, technology, engineering, and mathematics (STEM) workers. This is accomplished through support of undergraduate internships, graduate thesis research, and visiting faculty programs at the DOE laboratories; the Albert Einstein Distinguished Educator Fellowship for K–12 STEM teachers, administered by WDTS for DOE and for a number of other federal agencies; and annual, nationwide, middle- and high-school science competitions culminating in the National Science Bowl® in Washington, D.C. These investments help develop the next generation of scientists and engineers to support the DOE mission, administer programs, and conduct research.

WDTS activities rely significantly on DOE's 17 laboratories, which employ more than 30,000 workers with STEM backgrounds. The DOE laboratory system provides access to leading scientists; world-class scientific user facilities and instrumentation; and large-scale, multidisciplinary research programs unavailable in universities or industry. WDTS leverages these assets to develop and train post-secondary students and educators in support of the DOE mission.

### Highlights of the FY 2017 Budget Request

The FY 2017 Request maintains support levels of workforce programs conducted at DOE Laboratories. These experience-based STEM learning opportunity programs enable highly qualified applicants to conduct research at the DOE laboratories, in support of the workforce mission.

### Description

#### Activities at the DOE Laboratories

WDTS supports activities such as the Science Undergraduate Laboratory Internships program, the Community College Internships program, the Office of Science (SC) Graduate Student Research Program, and the Visiting Faculty Program. A goal of these programs is to encourage students to enter STEM careers especially relevant to the DOE mission. By providing research experiences at DOE laboratories under the direction of scientific and technical laboratory staff who serve as research advisors and mentors, these activities provide opportunities for participants to engage in research requiring specialized instrumentation; large-scale, multidisciplinary efforts; and/or scientific user facilities. WDTS activities are aligned with the strategic objectives of the National Science and Technology Council Committee on STEM Education (CoSTEM) Federal STEM Education 5-Year Strategic Plan.<sup>a</sup>

The **Science Undergraduate Laboratory Internships (SULI)** program places students from 2 and 4 year undergraduate institutions as paid interns in science and engineering research activities at DOE laboratories, working with laboratory staff scientists and engineers on projects related to ongoing research programs. Appointments are for 10 weeks during the summer term and 16 weeks during the fall and spring terms.

The **Community College Internships (CCI)** program places community college students as paid interns in technological activities at DOE laboratories, working under the supervision of a laboratory technician or researcher. Appointments are for 10 weeks during the summer term and, beginning in 2016, 16 weeks during a pilot spring term.

The **Office of Science Graduate Student Research (SCGSR)** program 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 SCGSR program provides supplemental awards for graduate students to pursue part of their graduate thesis research at a DOE laboratory 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 DOE laboratory in collaboration with a DOE laboratory scientist. Research award terms range from three months to one year.

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<sup>a</sup> [http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem\\_stratplan\\_2013.pdf](http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf)

The **Visiting Faculty Program (VFP)** goal is to increase the research competitiveness of faculty members and students at institutions of higher education historically underrepresented in the research community in order to expand the workforce that addresses DOE mission areas. 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; this helps increase the STEM workforce in DOE science mission areas at institutions historically underrepresented within the DOE enterprise. Appointments are in the summer term for 10 weeks.

#### Albert Einstein Distinguished Educator Fellowship

The Albert Einstein Distinguished Educator Fellowship Act of 1994 charges the Department of Energy (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 eleven months in a Federal agency or a Congressional office. WDTS manages the Albert Einstein Distinguished Educator Fellowship (AEF) Program for the Federal government. Fellows are supported by DOE and other Federal agencies. Typically, SC supports six Fellows each year; four are placed in Congressional offices and two are placed in SC. Participating agencies have included the National Science Foundation (NSF), the National Aeronautics and Space Administration (NASA), and the National Oceanic and Atmospheric Administration (NOAA), as well as other DOE offices. The Fellows provide educational expertise, years of teaching experience, and personal insights to these offices to advance science, mathematics, and technology education programs.

#### National Science Bowl®

The DOE National Science Bowl® (NSB) 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, question-and-answer format. More than 250,000 students have participated in the National Science Bowl® throughout its 25-year history, and it is one of the nation's largest science competitions.

The National Science Bowl® regional winning teams receive expenses-paid trips to Washington D.C. to compete at the National Finals in late April. Competing teams are composed of four students, one alternate, and a teacher who serves as an advisor and coach. SC manages the National Science Bowl®, provides central management of 116 regional events, and sponsors the NSB Finals competition.

In FY 2015, 5,300 middle school students from 697 schools and 9,000 high school students from 1,314 schools participated in the regional competitions, with 48 middle school and 68 high school teams (565 students) participating in the National Finals in Washington, D.C. All 50 U.S. States, District of Columbia, Puerto Rico, and the U.S. Virgin Islands were represented at regionals. More than 5,000 volunteers also participated in the local and national competitions. In FY 2015, the National Science Bowl® championship finals were held at the Lisner Auditorium (located on the campus of The George Washington University), featuring a live web-streaming broadcast of the event.

The DOE National Science Bowl® is aligned with the CoSTEM Federal STEM Education 5-Year Strategic Plan priority investment area for STEM engagement.

#### Technology Development and On-Line Application

This activity modernizes on-line systems used to manage applications and review, data collection, and evaluation for WDTS programs. A project to develop, build, and launch new online application and program support systems is progressing to improve program management, execution, and evaluation by WDTS program staff and by DOE laboratory staff. An important component of the systems is the ability to support regular evidence-based evaluation of program performance and impact. A phased approach is being used to develop and build the systems. In FY 2014, systems for the Albert Einstein Distinguished Educator Fellowship, the Office of Science Graduate Student Research Program, and National Science Bowl® were developed and launched. In FY 2015, emphasis was placed on administrative tool development and system updates. On the client side, new online tools were launched to guide SULI and CCI applicants when selecting a host lab and to provide application system self-help. On the program side, a streamlined VFP-Faculty review and a selection system was launched in time for the 2016 summer term application cycle, which opened in October 2015. Planned activities for FY 2016 include development of a management portal for the NSB question processes, development of new program evaluation toolsets, and development of alumni portals for tracking of past participants. In FY 2017, these new business management systems will be implemented.

### Evaluation Studies

The Evaluation Studies activity supports work to assess whether WDTS programs meet established goals through the use of collection and analysis of data and other materials, including pre- and post-participation questionnaires, participant deliverables, notable outcomes (publications, presentations, patents, etc.), and longitudinal participant tracking. In FY 2014, evaluation plans for each WDTS activity were completed. Enhanced data analysis efforts initiated in FY 2014 will be completed, enabling the launch of analysis, visualization, and reporting toolsets required to support the determination of impacts and outcomes.

In FY 2014, SC completed a study to identify disciplines in which significantly greater emphasis in workforce training at the graduate student or postdoc levels is necessary to address gaps in current and future SC mission needs. In this study, each Office of Science Federal Advisory Committee, each Associate Director, and each Laboratory Director were asked to provide expert assessment on the following: (i) STEM disciplines not well represented in academic curricula; (ii) STEM disciplines in high demand, nationally and/or internationally, resulting in difficulties in recruitment and retention at U.S. universities and at DOE laboratories; (iii) STEM disciplines for which the DOE laboratories may play a role in providing needed workforce development; and (iv) recommendations for programs at the graduate student or postdoc levels that can address discipline-specific workforce development needs. The outcomes of this study now guide prioritization of eligible SCGSR programmatic research areas and inform WDTS strategic planning. More broadly, the outcomes of this study have identified for SC both program-specific workforce development needs and crosscutting workforce development needs in areas such as computing and computational sciences.

A second triennial external peer review of participating host laboratories in the undergraduate and faculty programs, *viz.*, SULI, CCI, and VFP programs is nearly complete. An outcome of the prior program review resulted in the development and system-wide adoption of a set of common Core Requirements that serve as the minimum standard for managing WDTS laboratory programs across the complex. Additionally, a set of Model Practices was developed to help host labs achieve the Core Requirements. Lastly, each host lab was required to develop and adopt an Implementation Plan, thereby establishing a roadmap for achieving the programmatic baseline requirements. This review will assess progress made, determine if an operational baseline has been uniformly achieved, and identify areas requiring improvement or benefiting from the formulation of additional operational elements. Outcomes of this review are expected in early FY 2016.

Evaluation Studies is aligned with the GPRA Modernization Act of 2010, the President's management priorities,<sup>a</sup> and the 2008 Congressionally-mandated Academic Competitiveness Council initiative, which emphasized the need for federal programs (including STEM education programs) to demonstrate their effectiveness through rigorous evidence-based evaluation. WDTS works cooperatively with SC programs, other DOE programs, and other federal agencies through CoSTEM to share best practices for STEM program evaluation to ensure the implementation of evaluation processes appropriate to the nature and scale of the program effort.

### Outreach

WDTS engages in outreach activities, some in cooperation with other DOE program offices and select federal agencies, to widely publicize opportunities for student internships, SC Graduate Student Research program, the Visiting Faculty Program, and the Albert Einstein Distinguished Educator Program. The WDTS website<sup>b</sup> is the most widely used tool for prospective program participants to obtain information about WDTS and is the gateway to accessing the online applications for the WDTS programs. To help diversify the applicant pool, outreach is conducted via presentations to targeted key stakeholder groups, and via the web using webinar virtual meetings that highlight the programs, their opportunities, and the WDTS internship experience. A portfolio of recorded webinars is available on the WDTS website.

The Laboratory Equipment Donation Program is consolidated under Outreach, and it continues to provide excess laboratory equipment to faculty at non-profit research institutions and post-secondary educational institutions. Through the Energy Asset Disposal System, DOE sites identify excess equipment and colleges and universities can then search for equipment of interest and apply via the website. The equipment is free, but the receiving institution pays for shipping costs. This consolidation does not alter the scope of this activity.

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<sup>a</sup> <http://www.whitehouse.gov/administration/eop/ostp/nstc/committees/costem>

<sup>b</sup> <http://science.energy.gov/wdts/>

**Workforce Development for Teachers and Scientists  
Funding (\$K)**

	<b>FY 2015 Enacted</b>	<b>FY 2015 Current</b>	<b>FY 2016 Enacted</b>	<b>FY 2017 Request</b>	<b>FY 2017 vs. FY 2016</b>
<b>Activities at the DOE Laboratories</b>					
Science Undergraduate Laboratory Internships	8,300	8,300	8,300	9,300	+1,000
Community College Internships	1,000	1,000	1,000	1,250	+250
Graduate Student Research Program	2,500	2,500	2,500	2,575	+75
Visiting Faculty Program	1,700	1,700	1,700	1,800	+100
<b>Total, Activities at the DOE Laboratories</b>	<b>13,500</b>	<b>13,500</b>	<b>13,500</b>	<b>14,925</b>	<b>+1,425</b>
<b>Albert Einstein Distinguished Educator Fellowship</b>	<b>1,200</b>	<b>1,200</b>	<b>1,200</b>	<b>1,200</b>	<b>0</b>
<b>National Science Bowl®</b>	<b>2,900</b>	<b>2,930</b>	<b>2,900</b>	<b>3,000</b>	<b>+100</b>
<b>Technology Development and On-Line Application</b>	<b>750</b>	<b>750</b>	<b>750</b>	<b>675</b>	<b>-75</b>
<b>Evaluation Studies</b>	<b>600</b>	<b>600</b>	<b>600</b>	<b>600</b>	<b>0</b>
<b>Outreach</b>	<b>500</b>	<b>470</b>	<b>500</b>	<b>525</b>	<b>+25</b>
<b>Laboratory Equipment Donation Program</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>0</b>	<b>-50</b>
<b>Total, Workforce Development for Teachers and Scientists</b>	<b>19,500</b>	<b>19,500</b>	<b>19,500</b>	<b>20,925</b>	<b>+1,425</b>

## **Program Accomplishments**

**Science Undergraduate Laboratory Internships (SULI)** - In FY 2015, the total number of participating DOE host laboratories/facilities increased from 16 to 17. This increased participation, largely due to the quality and impact of the program, serves to broaden participant STEM sub-field experience-based training opportunities and enhance their overlap with DOE mission-critical research areas, where in this case, especially addressing fusion energy and plasma sciences.

**Community College Internships (CCI)** – In FY 2015, a pilot for a spring 2016 semester term increased the portfolio of experiential-based learning opportunity sub-fields to include combustion science and technologies.

**Office of Science Graduate Research (SCGSR)** – In FY 2015, the SCGSR Program supported 100 supplemental awards to graduate students to conduct their thesis research at 15 DOE national laboratories. Over two thirds of the awards support project terms ranging from 6-12 months. The SCGSR Program attracts graduate student applicants at various stages in their graduate education and from a broad range of graduate schools across the U.S. Awards were made to graduate students from 50 different universities who will conduct graduate research in areas that span the research missions of the six Office of Science program offices.

**Visiting Faculty Program (VFP)** – A VFP faculty participant from Howard University is now a collaborator on the PHENIX experiment (for Pioneering High Energy Nuclear Interaction experiment) at the Relativistic Heavy Ion Collider (RHIC) user facility (Brookhaven National Laboratory). Howard University is the only HBCU (Historically Black Colleges and Universities) member on the PHENIX collaboration.

**The National Science Bowl®** – In FY 2015, the NSB celebrated its 25<sup>th</sup> annual competition. On Science Day, students heard from a two-time Academy Award winner (Dr. Doug Roble, Digital Domain), as well as from five leading computational scientists at DOE laboratories (Dr. Jacqueline Chen, Distinguished Member of Technical Staff at the Combustion Research Facility, Sandia National Laboratories; Dr. Timothy Germann, Director of the DOE “Exascale Co-Design Center for Materials in Extreme Environments,” Los Alamos National Laboratory; Dr. Katherine Riley, Team Leader, Argonne Leadership Computing Facility; Dr. Kathy Yelick, Associate Laboratory Director for Computing Sciences, Lawrence Berkeley National Laboratory and Professor of Electrical Engineering and Computer Sciences at the University of California, Berkeley; and Robert French, Adam Simpson, Oak Ridge National Laboratory, and Dr. Carolyn Lauzon, Office of Science, demonstrating Tiny Titan), to learn about high-performance computing. To enhance the student’s learning opportunities, new virtual experience kiosks were developed and used at the 4H Center, allowing students to self-explore and learn about scientific applications of high-performance computing. Also demonstrated at the 4H Center was “Tiny Titan,” an interactive educational display computer that visually shows the power of multicore processing and parallel architectures, both of which help form the technological basis for all high-performance computers in use today. The championship finals were held for the first time at the Lisner Auditorium at George Washington University, with capabilities used to live stream broadcast the entire event.

**Technology Development and On-Line Application** – In FY 2015, new application and program tools for the SULI, CCI, and VFP programs were developed and launched, addressing needs of clients as well as administrators.

**Workforce Development for Teachers and Scientists**

**Activities and Explanation of Changes**

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<b>Activities at the DOE Laboratories \$13,500,000</b>	<b>\$14,925,000</b>	<b>\$+1,425,000</b>
<i>Science Undergraduate Laboratory Internships (\$8,300,000)</i> SULI supports approximately 820 students, including support for an additional 45 fall and spring semester students.	<i>Science Undergraduate Laboratory Internships (\$9,300,000)</i> SULI will support approximately 905 students.	<i>Science Undergraduate Laboratory Internships (\$+1,000,000)</i> Increased funding supports an additional 50 summer and 35 semester term placements.
<i>Community College Internships (\$1,000,000)</i> CCI supports approximately 100 students.	<i>Community College Internships (\$1,250,000)</i> CCI will support approximately 125 students.	<i>Community College Internships (\$+250,000)</i> Increased funding supports an additional 25 placements.
<i>Graduate Student Research Program (\$2,500,000)</i> The SCGSR program supports approximately 100 graduate students for periods of 3 months to 1 year to conduct a part of their thesis research at DOE laboratories. Targeted priority research areas will be informed by SC's recent workforce training needs study.	<i>Graduate Student Research Program (\$2,575,000)</i> The SCGSR program will support approximately 102 graduate students for periods of 3 months to 1 year to conduct a part of their thesis research at DOE laboratories. Targeted priority research areas will be informed by SC's workforce training needs studies.	<i>Graduate Student Research Program (\$+75,000)</i> Increased funding supports additional graduate students conducting their thesis research in priority research areas.
<i>Visiting Faculty Program (\$1,700,000)</i> VFP supports approximately 70 faculty and 35 students.	<i>Visiting Faculty Program (\$1,800,000)</i> VFP will support approximately 70 faculty and 45 students.	<i>Visiting Faculty Program (\$+100,000)</i> Increased funding supports 10 additional student placements.
<b>Albert Einstein Distinguished Educator Fellowship \$1,200,000</b>	<b>\$1,200,000</b>	<b>\$0</b>
The FY 2016 request supports 6 Fellows.	The FY 2017 request will support 6 Fellows.	No change.
<b>National Science Bowl® \$2,900,000</b>	<b>\$3,000,000</b>	<b>\$+100,000</b>
WDTS supports the finals competition and provides central management of 116 regional events, involving 14,500 students from all fifty states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.	WDTS will sponsor the finals competition and provide central management of 116 regional events, involving 14,300 students from all fifty states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.	Increased funding supports development of an inventory of NSB questions, including additional visual bonus questions emphasizing energy science topics relevant to the DOE mission.

FY 2016 Enacted	FY 2017 Request	Explanation of Changes FY 2017 vs FY 2016
<b>Technology Development and On-line Application Systems \$750,000</b>	<b>\$675,000</b>	<b>-\$75,000</b>
Funding supports development and operation of the on-line systems.	Funding will continue development and operation of the on-line systems.	Funding decreases due to efficiencies gained through leveraging prior code development.
<b>Evaluation Studies \$600,000</b>	<b>\$600,000</b>	<b>\$0</b>
FY 2016 funding continues support for evaluation activities, including data archiving, curation, and analyses.	FY 2017 funding will continue support for evaluation activities, including data archiving, curation, and analyses.	No change.
<b>Outreach \$500,000</b>	<b>\$525,000</b>	<b>+\$25,000</b>
Funding supports a public web portal to track the inventory of STEM workforce internship and outreach activities and opportunities across the DOE laboratory complex.	Funding will support a public web portal to track the inventory of STEM workforce internship and outreach activities and opportunities across the DOE laboratory complex.	Increased funding supports LEDP activities, which are being consolidated under Outreach; there is a small decrease to other Outreach activities due to be completed in FY 2016.
Funding supports outreach activities to the scientific community targeting Office of Science mission-driven disciplinary workforce needs in the next 5 to 10 years.	Funding will support outreach activities to the scientific community targeting Office of Science mission-driven disciplinary workforce needs in the next 5 to 10 years.  Funding will also support Laboratory Education Equipment Donation Program (LEDP) activities.	
<b>Laboratory Equipment Donation Program \$50,000</b>	<b>\$0</b>	<b>-\$50,000</b>
Funding supports the ongoing program.	Funding for this activity is now under Outreach.	Funding for this program is consolidated under Outreach. This consolidation does not alter the scope of this activity.