

Testimony of
William J. Valdez
Director, Office of Workforce Development for Teachers and Scientists
Office of Science, U.S. Department of Energy
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Thank you, Mr. Chairman and Members of the Subcommittee, for this opportunity to discuss the role that the Department of Energy's (DOE) Office of Science plays in scientific and technical workforce development and education. We appreciate your strong commitment to improving science and math education and training in the United States.

The Office of Science is the Federal government's largest supporter of civilian basic research in the physical sciences. This basic research supports the Department's missions in energy, the environment, and national security. The Office of Science manages 10 national laboratories and more than 30 major scientific user facilities that provide the scientific community with state-of-the-art research tools that help accomplish the Department's goals and maintain U.S. competitiveness in science and technology.

The Department's most significant contribution to the development of a scientific and technical workforce has been through the support of graduate students pursuing advanced degrees, post-doctoral students who work on research projects, and, to a much smaller degree, hands-on research opportunities for undergraduate students and K-12 educators and informal experiential learning opportunities for K-12 students. These individuals utilize DOE research facilities and work side-by-side with the scientific and technical staff at the national laboratories.

Those national laboratories are unique settings for research, mentoring, and collaboration. Through structured and unstructured workforce development and science education programs at DOE's 17 national laboratories, the power authorities and other DOE facilities, the Department engages with more than 250,000 students of all ages and 19,000 K-12 educators on an annual basis.

The Office of Workforce Development for Teachers and Scientists (WDTS), which I manage, is the only program office in DOE that has a specific mission in science, technology, engineering and mathematics (STEM) workforce development and education. Our programs reach 600 undergraduate students, 16,000 K-12 students, and 150 K-12 educators annually. We do this with an \$8 million annual budget and under specific statutory authority (Public Laws 93-438 and 101-510, and most recently the Energy Policy Act of 2005).

The 17 DOE national laboratories, the power authorities and other DOE facilities use WDTS funding as “seed money” to develop complementary programs that are designed to meet their local needs. Our programmatic philosophy is “nationally designed programs, locally delivered.” This model has relied on partnerships within the Department of Energy and with external organizations.

While WDTS directly funds 600 undergraduate students for summer internships, the total number of undergraduate research interns at all of the DOE laboratories is 4,100. Similarly, WDTS directly funds 150 K-12 educators, but a total of 19,300 K-12 educators are involved in programs at DOE laboratories and facilities.

Partnerships enable WDTS to coordinate with and leverage the resources and capacity of the Office of Science (SC). SC works with more than 300 of the top universities in the Nation, manages 10 of the biggest national laboratories in the Federal government, and deals directly with hundreds of high technology companies.

In recognition of widespread concern about STEM workforce development, the Secretary of Energy, in 2006, commissioned a review by the Secretary of Energy Advisory Board of the Department’s activities in STEM education. That review concluded that DOE has a clear role in STEM education and that partnerships are the primary vehicle we should use to achieve our goals. The Board stated:

“[A] review of the Department’s educational programs as well as a review of the educational efforts in other Federal agencies, leads us to our conclusion that DOE has a significant opportunity to enhance STEM education in the Nation. Moreover, it is clear from our review (as well as from the GAO reports) that the educational activities of DOE and other Federal agencies could benefit from increased cooperative activities with one another, with industry, with colleges and universities, and with science teachers’ professional organizations. In both nationwide influence and in cooperative partnerships, DOE is already positioned to take a leadership role. DOE’s national laboratories are geographically distributed over the country, allowing access to teachers across the Nation. Moreover, the network of national laboratories is also tightly linked with industrial and academic resources, giving DOE the ability to forge educational partnerships that can extend its reach, and therefore also its capacity to enhance STEM education nationwide.”

As a result of its stakeholder meetings and other outreach efforts, WDTS has had discussions with a wide range of organizations proposing partnerships. Let me give you four examples of partnerships that could make our programs more effective:

- WDTS has an existing partnership with the National Science Foundation (NSF) that illustrates how Federal resources can be effectively leveraged. DOE has the 17 national laboratories, but NSF has greater access to undergraduate and educator populations. Our agreement with NSF enables us to share programs, with a result that in FY 2006 NSF supported 195 educators and students at seven of our national laboratories. (Table 1)

Table 1**NSF Funded Participants by DOE Laboratory and WDTS Program for FY2006**

DOE Laboratories	WDTS Programs	Science Undergraduate Laboratory Internship				Total
		Community College Institute	Faculty & Student Teams	Pre-Service Teachers	Science Undergraduate Laboratory Internship	
Argonne National Laboratory		--	40	--	1	41
Brookhaven National Laboratory		16	41	--	20	77
Lawrence Berkeley National Laboratory		6	22	2	5	35
National Renewable Energy Laboratory		--	--	--	1	1
Oak Ridge National Laboratory		1	22	--	--	23
Pacific Northwest National Laboratory		4	12	1	--	17
Thomas Jefferson National Laboratory		--	--	--	1	1
Total		27	137	3	28	195

This is a beginning, but we could do more. DOE mentor scientists who participate in Office of Science and other DOE programs have a long history of working with students, and many have indicated they are eager to expand their efforts. One resource that could help is the Federal laboratory system. The Federal government owns more than 250 national laboratories across the Nation, and many of these have STEM workforce needs similar to those of DOE. Thus, WDTS could partner with USDA labs, for example, to prepare the future workforce to support the expanding bio-fuels industry, or with Department of Defense laboratories to develop our national security workforce.

- WDTS is engaged in extensive discussions with the Department of Education on better support for the Administration's Adjunct Teacher Corps initiative. The mentor scientists at DOE's national laboratories could constitute a promising potential core of the Adjunct Teacher Corps. Sandia National Laboratories, which is part of the National Nuclear Security Administration within DOE, is taking a leadership role with WDTS to structure a program that would enable us to work with the Department of Education to achieve the Administration's goal of placing 30,000 adjunct teachers in the Nation's classrooms by 2015. If Sandia's pilot program with the Department of Education is successful, the concept could be expanded to other Federal agencies with national laboratories and pools of mentor scientists.

Secretary of Education Margaret Spellings on May 9, 2007 commented on this emerging partnership: “When I was in Senator [Jeff] Bingaman’s state of New Mexico I visited a local high school where scientists from Sandia Labs were teaching chemistry. We need to make this the norm around the country.”

- The core element of WDTS’s programs and other programs carried out at the DOE laboratories is providing educators and students with hands-on research experience. These research experiences supplement what students learn in the classroom and help educators better understand the process of science. Thus, we want to partner with organizations like universities and corporate laboratories that have similar infrastructure to that of the DOE national laboratories. As a start, we have entered into discussions with a university and a major non-profit science educational group in Boston about pilot programs that would share resources and capabilities.
- WDTS is developing what we are calling a “trusted partners” approach to reach under-represented populations. Students and educators tend to learn about our programs primarily through recommendations from individuals and organizations whose opinions the students and educators themselves trust. This is particularly true of students and educators from under-represented populations who have not built a trust relationship with the Department of Energy. As a result, we are exploring partnerships with several national organizations to help identify their most promising students and educators for our programs. We have had discussions, for example, with a major Hispanic communications network about developing innovative approaches that reach the best and brightest Hispanic students and teachers for our programs.

Evaluation

I would now like to turn to the need for evaluation and intelligent program design.

In this regard, I would like to commend the Department of Education and the Office of Management and Budget (OMB) for the work they have done through the Academic Competitiveness Council (ACC). The catalogue of existing STEM education programs in the Federal government and the emphasis the ACC Report places on the need for rigorous evaluation catalyzed a discussion in Washington, D.C. policy circles about the need for rigorous evaluation of STEM education and workforce programs.

The ACC Report’s recommendations were influential in the development of WDTS’s future direction. This was a discussion that was much needed because, frankly, WDTS has done a poor job over the past 10 years of rigorously evaluating our programs. As a result, and under the specific direction of Under Secretary for Science Raymond Orbach, we are committed to improving our ability to evaluate the impact and effectiveness of our programs.

We have data that indicate our experiential learning programs are yielding good results (i.e., promoting interest in STEM fields). We are in the process of developing a plan for more rigorous study of the program that will enable us to demonstrate the program’s

impact. Based on the results, we will be able to refine the program and pursue the most effective strategies going forward.

One lesson that was reinforced by the ACC process is that evaluation and assessment are crucial to the effective design of STEM workforce programs. For example, during the 1980s and 1990s, the Department funded rigorous longitudinal workforce studies that enabled program managers to identify specific future workforce needs. WDTS is in the process of re-invigorating that effort and within the next 12 months will have completed a pilot workforce study that identifies the workforce needs, by scientific discipline, for the Office of Science Federal and national laboratory staff.

This workforce study is being done in collaboration with the National Nuclear Security Administration (NNSA). By including the 10 national laboratories managed by the Office of Science and the three defense national laboratories managed by NNSA (Lawrence Livermore National Laboratory, Sandia National Laboratories, and Los Alamos National Laboratory) in the study, we will account for the majority of the R&D performed by the Department. In future years, we hope to include other DOE laboratories and R&D programs in this effort.

Identifying gaps

Rigorous evaluation of programs and the use of workforce data from the analysis that we will do over the next 12 months will enable WDTS to identify opportunities to improve our STEM workforce development and education efforts.

WDTS currently manages nine programs for students and educators. Those programs emphasize experiential learning opportunities for students and educators, such as the Academies Creating Teacher Scientists (ACTS) program; and world class celebrations of scientific achievement for students, such as the National Science Bowl. We have two decades of experience managing these types of programs and believe that they are effective and are contributing to our Nation's efforts to improve STEM education and proficiency, although more rigorous evaluations are in order.

But conversations with our stakeholders and our own internal analysis have revealed that there are opportunities for our programs to better achieve their objectives. Let me give you two examples:

- One potential gap is in the development of talent in our Federal workforce. While one of our goals is to encourage students to join Federal service, we do not have programs in place that provide a clear link for them to seek employment with the Department, such as helping them navigate the difficult Federal hiring process. In addition, we do not have the workforce assessment tools in place that would inform us about whether we need more physicists, chemists, or engineers. The workforce assessment we are doing will help in that regard. We are also working with DOE's Chief Human Capital Officer, Dr. Jeff Pon, to develop programs specifically targeted at the Federal STEM workforce.

- Another area for improvement is our collective need to better align agency STEM efforts with larger Federal mission needs. Representatives from various Federal agencies have emphasized the need to work collaboratively to solve our mutual STEM education and workforce challenges. One result is that my colleague, Dr. Joyce Winterton of NASA, has taken the initiative to form a brownbag lunch group of Federal science and technology agencies as a forum for discussion and collaboration. I am also talking with the Federal Laboratory Consortium, the Triangle Coalition and a host of other groups about partnerships designed to bring Federal agencies together with the educational community and industry. We need to work together and, in fact, a grassroots process supported by Federal S&T agencies has already begun.

Conclusion:

I would like to conclude by highlighting several statistics:

- \$135 billion – the annual Federal investment in R&D that is managed by 34 agencies
- 257 – Federal laboratories that belong to the Federal Laboratory Consortium and are active in communities nationwide
- 206,000 – Federal scientists and engineers (not including contractors)

When all of these numbers are put together, it is evident that we have excellent resources for a coordinated Federal response to the Nation’s STEM education challenge.

The 34 Federal R&D mission agencies – such as NASA, NOAA, DoD, NIH, USDA and EPA – have a long-term and enduring interest in their workforces and STEM education. This has been a strong Federal resource that can continue to support our efforts to address the national challenge of educating the future U.S. workforce and helping to prepare our citizens for the emerging era of scientific discovery and innovation.

Thank you for offering me this opportunity to provide a perspective on this important issue. I look forward to answering the Committee’s questions.

Testimony Abstract
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Federal science and technology mission agencies, such as the Department of Energy, have enormous resources that could be used for science, technology, engineering and mathematics (STEM) education and workforce development. Those resources complement what is offered by the Department of Education and the National Science Foundation (NSF). The Office of Workforce Development for Teachers and Scientists (WDTS) is developing partnerships between other Federal mission agencies, NSF, the Department of Education and other organizations that have a strong interest in STEM education and workforce development as part of a long-term strategy to improve the Department's STEM workforce and overall science literacy in the U.S. WDTS is also developing a rigorous program evaluation effort that is consistent with the recommendations of the Academic Competitiveness Council's May 2006 Report. That effort will include partnering with organizations that have proven expertise to develop the tools and methodologies that will demonstrate the benefits and effectiveness of WDTS programs. WDTS, based on extensive conversations with its stakeholders, is reprioritizing its programs to ensure that they are effective and deliver intended benefits. WDTS is developing business plans for all of its programs that describe their goals, resource requirements, and connection to the DOE mission.

BIOGRAPHY BILL VALDEZ

Bill Valdez is the Director of the Office of Workforce Development for Teachers and Scientists within the Department of Energy's Office of Science. His responsibilities include developing workforce strategies for the Department's scientific and technical workforce, and creating opportunities for students and educators to participate in the Nation's research enterprise as a means to improving the competitiveness of U.S. industry and overall scientific literacy.

In addition, Mr. Valdez has been leading an interagency effort, coordinated by the White House Office of Science and Technology Policy, that is designed to establish credible outcome measures for basic research, create new evaluation methods that focus on systems level analysis, and promote business models that will enable Federal R&D managers to improve investment decisions.

Previously, Mr. Valdez was the Director of Planning and Analysis at the Department of Energy's Office of Science. His responsibilities included corporate strategic planning, R&D evaluation, and Federal S&T policy development.

Mr. Valdez was elected as a Fellow of the American Association for the Advancement of Science in 2006 and is Vice Chair of the Senior Executive Association's Board of Directors. He was elected to the Board of Directors of the Senior Executive Association in 2005.

Mr. Valdez has held various positions at the Department of Energy since 1994, including serving as executive director of the DOE R&D Council and developing evaluation techniques for technology transfer programs. Mr. Valdez also served at the White House Office of Science and Technology Policy from 1998-99. His responsibilities included co-authoring a report on strategies designed to improve the future scientific workforce as the Nation's demographics change, developing interagency technology initiatives, and advising on international energy initiatives.

Prior to working at DOE, Mr. Valdez worked as a Senior Project Manager in private industry where he provided strategic planning services to Asian and European multinational corporations.

Mr. Valdez received a Bachelor of Arts from the University of Texas and his Master of Arts in International Economics and Energy Policy from the Johns Hopkins School of Advanced International Studies.