New Mexico State University

ARROWHEAD CENTER

LEADING ECONOMIC DEVELOPMENT FOR NEW MEXICO STATE UNIVERSITY

Identification of Strategies to Leverage Public and Private Resources for National Security Workforce Development

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NNSA
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Live, Learn and Thrive

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1.0 INTRODUCTION

This report documents the identification of strategies to leverage public and private resources for the development of an adequate national security workforce as part of the National Security Preparedness Project (NSPP), being performed under a Department of Energy (DOE)/National Nuclear Security Administration (NNSA) grant. This report is due February 1, 2009, as performance measure 3.4.1 (Grant No: DE-FG52-07NA28084, Arrowhead Center proposal, Page 17).

There are numerous efforts across the United States to develop a properly skilled and trained national security workforce. Some of these efforts are the result of the leveraging of public and private dollars. It stands to reason that some efforts would not be possible without the leveraged dollars. As budget dollars decrease and the demand for a properly skilled and trained national security workforce increases, it will become even more important to leverage every education and training dollar.

2.0 IDENTIFICATION OF CURRENT PUBLIC/PRIVATE PARTNERSHIPS FOR WORKFORCE DEVELOPMENT EFFORTS

While researching this particular topic, it was evident that several government agencies, including the DOE, are already heavily involved in workforce development activities. The majority of the activities, and in some cases all activities, leverage government dollars with private dollars. The leveraging of dollars serves many purposes. These include increasing the amount of training that can be delivered and therefore increasing the number of people reached, increasing the number and quality of public/private partnerships, and increasing the number of businesses that are involved in the training of their future workforce.

The DOE and the national laboratories are involved in many educational efforts that contribute to the development of a properly skilled and trained national security workforce. Some of these efforts are highlighted below.

Department of Energy Sponsored Programs

Project	Description
DOE National Science Bowl	**For middle and high school students, it is the only national science competition in the country sponsored by a federal agency. Over 18,000 students participate in teams from all over the United States with the finals taking place in Washington D.C. Students can also participate in the Hydrogen Fuel Cell Model Car Challenge, where they design, build, and race their model cars. The purpose of the National Science Bowl is to expose students to the areas of math and science and encourage them to pursue education and careers in these fields.[i]**
Real World Design Challenge	**The goal of the Real World Design Challenge is to "bridge the needs of industry with the future of education" by involving 9th-12th grade students in developing solutions to**

	real engineering problems and exposing them to advanced computer software. The Real World Design Challenge began in the 2008-2009 school year and currently has ten states participating and plans to expand to all fifty states in the near future. The challenge gives students the opportunity to work together in teams to come up with innovative solutions to help national industries solve national security-related problems.[ii]
Science Undergraduate Laboratory Internships	**The Science Undergraduate Laboratory Internship program provides undergraduate students with paid internships in one of several of DOE's laboratory facilities across the United States. Each facility specializes in a different area of research, giving students the opportunity to work with DOE scientists and learn about areas of national security research that are interesting to them. Students majoring in science, math, engineering, and technology fields can apply. Students majoring in public policy or science can apply for internships at the DOE headquarters.[iii]**
Community College Institute of Science and Technology Internship	**The Community College Institute of Science and Technology Internships provide paid internships for students participating in community college programs. Students can apply to work at any of the lab locations and work closely with scientists and researchers on projects underway at that location. In addition to working on research projects, students attend career planning and other training sessions.[iv]**
Pre-Service Teacher Internship	**The Pre-Service Teacher Internship is designed for students training to become K-12 teachers in the areas of math, science, or technology. Students work with a scientist at the lab on research projects and with a current K-12 teacher who is familiar with the lab. Each laboratory offers different research options, and any student currently in an undergraduate or graduate teacher preparation program is eligible to apply.[v]**
Nonproliferation Graduate Program	**The Nonproliferation Graduate Program is offered by the National Nuclear Security Administration (NNSA) branch of the Department of Energy. Participants in the program are paid to work in the office of Defense Nuclear Nonproliferation on projects regarding the detection, prevention, and reversal of proliferation of nuclear weapons and on lessening the risks associated with running nuclear operations. The program is 12 months long and offered by the Pacific Northwest National Laboratory in Washington state, with an orientation and training in Washington DC. It gives students experience working with the federal government and provides the opportunity for collaboration with a variety of other private and public institutions.[vi]**

Albert Einstein Distinguished Educator Fellowship program	**The Albert Einstein Distinguished Educator Fellowship Program provides fellowships to elementary or secondary math and science teachers in a Congressional office or one of many federal agencies such as DOE, NASA, NIH, NASA, or NOAA. Teachers are eligible to apply if they have spent five of the last seven years in a full time teaching position in a public or private school with at least 75% of their time spent teaching math, science or technology courses. Past Fellows have worked on projects such as: designing national education programs in science, math, and technology, creating internet science education programs, and drafting legislation to improve education in the United States.[vii]**
Faculty and Student Teams (FaST) Program	**Sponsored by the DOE, Office of Science and the National Science Foundation, each team is comprised of one university faculty member and 2-3 undergraduate students who work on research projects over the summer at one of the DOE national labs. Teams from schools with high minority enrollments and limited research facilities and targeted.[viii]**

The DOE supports over 20 national laboratories across the nation, each with its own focus within the national security field. Numerous educational opportunities for students of all ages are available and serve as valuable tools for exposing future generations of mathematicians, scientists, and engineers to the national security field.

National Laboratory Sponsored Programs

National Laboratory	Project
Ames Laboratory ***Ames, Iowa***	**Ames Laboratory partners with Iowa State University on collaborating projects, allows researchers to act as faculty members at the University, and hires graduate students to work in the lab. For younger students, the Ames Laboratory sponsors the Science Bowl and Elementary School Science Nights where younger students can come and see demonstrations of scientific principles. Ames Laboratory also co-sponsors the Science Bound program where students who show potential of excelling in areas of math and science are identified during their seventh grade year and are given opportunities to participate in math and science enrichment programs.[ix]**
Argonne Laboratory ***Chicago, Illinois***	**Argonne National Laboratory offers many programs for students from kindergarten through post-doctoral studies. Programs for K-12 students include Introduce a Girl to Engineering Day, a Women in Science conference, a Rube Goldberg machine contest, field trips to the lab, and middle school Science Bowl competition. For undergraduate students Argonne National Laboratory offers internships,**

	research aide appointments, a symposium for undergraduates majoring in math, science, and engineering fields, cooperative education between universities and the laboratory, and faculty-student team fellowships. Graduate programs include a Nanoscience research summer school program, the National School on Neutron and X-ray Scattering program, and a variety of different appointments as research aides, guest graduates, thesis parts, or laboratory graduate research. They also offer several faculty and post-doc programs.[x]
Bonneville Power Administration ***Portland, Oregon***	**Provision of education for elementary and secondary school- age children in the Pacific Northwest with a focus on electricity, energy efficiency and conservation, and fish and wildlife. Mentoring and tutoring services, summer science camps, science competitions, worksite visits, and career based learning experiences for children and teens in the area are also offered.[xi]**
Brookhaven National Laboratory ***Upton, New York***	**Educational opportunities for K-12 students include middle school and high school Science Bowls, workshops for middle school and high school students, the Minority High School Apprentice Program, high school essay contests, high school research programs, high school bridge building contest, and a community summer science program for high school students. Younger students have the opportunity to visit the Science and Learning Center, an interactive education center that provides hands-on labs and teaches scientific principles to 1st-12th graders. Brookhaven National Laboratory also sponsors the Open Space Stewardship Program, which gives students the opportunity to participate in environmental research and encourages them to pursue careers in science and technology fields. Educational opportunities for undergraduate students include internships, Homeland Security scholars and Fellows program, college mini-semesters, and faculty and student teams. Graduate students can participate in the Homeland Security Scholars and Fellows program as well as the graduate research internship program, or becoming a junior professional officer at the International Atomic Energy Agency.[xii]**
B&W Pantex ***Amarillo, Texas***	**Responsible for maintaining the safety and security of nuclear weapons. Educational programs support the goal of introducing students to careers in math, science, and engineering, including Science Bowls, employee tutoring for students falling behind in reading or math, fuel cell car race for middle school students, Technical Scholarship program that provides scholarships to help students obtain degrees in math, science, and engineering, monetary donations to support math and science programs in schools, helping boy and girl scouts obtain their merit badges in nuclear science, Empower Yourself-Stay in School and Step Up to Success seminars on careers and education planning for minority students at risk of dropping out of high school, participation in Texas Alliance for Minorities in Engineering**

	(TAME), Women in Science Endeavors (WISE) seminar, sponsors Future Scientists and Engineers of America clubs in middle schools and provides judges for regional science fairs.[xiii]
Fermilab ***Batavia, Illinois***	**Science-related classroom programs, presentations, and activities are available for K-12 students, as well as guest speakers. Undergraduate internships in physics and science and technology areas are available along with guest speakers for classrooms and guided tours for college groups. Graduate students can utilize research appointments and awards for the best thesis work in that laboratory for the year. Other educational opportunities for students include the Lederman Science Center of interactive exhibits for K-12 students, and the U.S. Particle Accelerator School which provides undergraduate and graduate courses in physics and beam technology in schools over the country.[xiv]**
Idaho National Laboratory ***Southeastern Idaho***	**Laboratory researchers are paired with area K-12 teachers and teams of teachers and high school students work on research projects associated with the lab. Excess equipment is donated to public and private schools in Idaho. Mini-grants to K-12 schools to support science, math, and technology programs are available as well as the Science Bowl each year. Internships are offered for undergraduate students and fellowships are available for recent doctoral graduates, international faculty, and other scientists to work at the lab temporarily. The Idaho National Laboratory also partnered with Idaho State University to create the Energy Systems Technology and Education Center on campus which has secured federal funding to ensure the incoming energy workforce is properly trained.[xv]**
Lawrence Berkeley National Laboratory ***California***	**Operated by the University of California, the lab offers offer a variety of internships for high school, undergraduate, or community college students, sponsorship of Science Bowls in the area and participation in the Faculty and Student Teams program. Tours, informal talks, and lectures to school groups are also available.[xvi]**
Lawrence Livermore National Laboratory ***California***	**Educational opportunities include a science and engineering fair for 7-12th graders, Science on a Saturday for middle and high school students, high school science tours, a one-day conference called "Expanding Your Horizons in Math and Science" for middle and high school girls to encourage them to enter the math and science field, field trips for 5th grade classes called "Super Science Field Trips," and scout and science club field trips. Every summer, Lawrence Livermore National Laboratory has 300-400 graduate and undergraduate students working in the lab. Internships, a Military Academic Research Academy, and Homeland Security Internship Program are also available.[xvii]**

Los Alamos National Laboratory ***Los Alamos, New Mexico***	**High school students in the region can participate in the High School Cooperative Program, where they can work at the lab full-time during the summer between their Junior and Senior year and part-time during the school year. Los Alamos National Laboratory also sends guest speakers around the state to speak to students to get them interested in the science field and offers internships for high school students, undergraduate, and graduate students.[xviii]**
National Energy Technology Laboratory ***Pennsylvania, West Virginia, Oregon, Alaska, and Oklahoma***	**Educational opportunities exist in each of these states. High school students can participate in internships, mentoring programs, and shadowing programs for the national security career field. In Oklahoma, high school students and college freshmen can teach science lessons to elementary school children through the Pawhuska Teaching Academy. National Energy Technology Laboratory researchers participate in an "Adopt-A-School" program that mentors high school students. Sponsorship of Science Bowl competitions in Pennsylvania, West Virginia, and Oklahoma. College planning is available for students and parents and an online information site about engineering and what a career in engineering entails. College students have access to internships and mentoring programs, as well as several research fellowships in different locations around the country.[xix]**
National Renewable Energy Laboratory ***Golden, Colorado***	**Educational opportunities for K-12 students include middle school and high school Science Bowls, tutoring for fourth grade students in the area to improve their science reading skills and a middle school hydrogen fuel cell car competition. At the college level, the laboratory offers internships for undergraduate and community college students. Undergraduate and graduate students can also take part in the Research Participants Program that allows them to participate in lab programs and projects.[xx]**
Oak Ridge National Laboratory ***Oak Ridge, Tennessee***	**Partners with the American Museum of Science and Energy to provide K-12 students with summer camps, symposiums, and other educational opportunities. The Laboratory has donated money to Tennessee schools to upgrade science classrooms and provides educational tours and guest speakers for schools. There is a two-week summer program for exceptional high school students to learn about the Laboratory efforts. Sponsorship of Science Bowls in the area. For college students, the lab offers a college scholarship for a child of a current employee every year. Collaborations with colleges and universities are available to give students the opportunity to spend time in the lab and offer several internship and fellowship programs for graduate, undergraduate, faculty, and post-doc groups are available.[xxi]**
Pacific Northwest National Laboratory	**Besides hosting the Nonproliferation Graduate program, the Laboratory offers several other educational opportunities. Pre-college students can participate in shadowing,**

Washington	internship, or apprenticeship programs. The Young Women in Science Program is designed to introduce more females to the sciences. Undergraduate and graduate students can participate in a number of internships and fellowships including the National Security Internship, the Department of Homeland Security Scholars/Fellows program, and the Summer Research Institute in Interfacial and Condensed Phase Chemical Physics.[xxii]
Princeton Plasma Physics Laboratory *Princeton, New Jersey*	K-12 educational programs offered include middle and high school Science Bowls, tours and school visits, a conference for young women, "Science on Saturday" program, and high school internships. Undergraduate students can participate in internships or the National Undergraduate Fellowship Program. Graduate students can gain experience at the lab by participating in Princeton University's Program in Plasma Physics.[xxiii]
Sandia National Laboratory *New Mexico and California*	Numerous educational opportunities are available to those in both regions, including online science resources, museums, family science nights, Science Bowls, science fairs, environmental education, seminars, and a scholarship program. Several internships and student programs at the undergraduate level exist within Sandia National Laboratories, as well as fellowships and post-doctoral positions.[xxiv]
The Savannah River Site *Southeastern South Carolina*	Offers hands-on programs for kids in grades K-12. Sponsorship of the Science Bowl, workshops, lectures, tours that promote careers in science and engineering, have internships and work-based opportunities for high school and college students, mini-grants program, and hosts the science fair and the "Science and Technology Enrichment Program" to help inspire students to pursue science careers.[xxv]
Thomas Jefferson National Accelerator Facility *Newport News, Virginia*	Offers a number of online science-based activities, games, and puzzles targeted at elementary-aged children, under graduate internships, summer honors program for high school students, and a pre-service teacher program. Lectures and events are available for middle and high school students.[xxvi]

3.0 IDENTIFICATION OF GAPS IN PUBLIC/PRIVATE PARTNERSHIPS FOR WORKFORCE DEVELOPMENT EFFORTS

The gaps in public/private partnerships for workforce development efforts in the national security technology field center mainly around two areas - the lack of partnerships with private entities and accessibility to opportunities. Many partnerships have been established with school districts and higher education facilities, especially those in close proximity to national laboratories, DOE, or NNSA office locations. Partnerships with private businesses in close proximity to these

locations can be explored to strengthen and increase the number and quality of public and private partnerships.

While there are many opportunities for students in close proximity to national laboratories, DOE, or NNSA offices, opportunities for interaction outside these areas is limited. Not all opportunities can or should be available outside of office locations. However, provision of some opportunities through a distance delivery mechanism is worth exploring.

4.0 STRATEGIES FOR RECRUITMENT OF PRIVATE PARTNERS

Private businesses that are close in proximity to or have ties to national laboratories and NNSA locations will make good partners for a variety of reasons. These include goodwill in the communities where they are located, an investment in the education of youth, and a patriotic interest in training future employees for national security technology businesses. Private businesses of all types can be targeted, not just those with a focus on national security technologies. Most private businesses are interested in being involved in their communities and many place the education of the youth in their communities as a top priority.

Partnerships with private businesses can be in the form of mentoring, judging of contests, provision of materials, supplies, or services, guest lecturers, opportunities for executive in residence, and/or cash contributions. Programs such as volunteer educators from business and industry, funds for a summer internship program, and assistance with the development of "real world" curriculum deserve emphasis. Most post-secondary and some secondary institutions have distance delivery mechanisms in place and could provide distance delivery. Many private businesses are choosing to use distance delivery technologies as well and would make great partners with the NNSA.

5.0 CONCLUSION

The NNSA and the National Laboratories do an admirable job of partnering with secondary and post-secondary institutions. Partnerships across the nation with private businesses will allow the NNSA and national laboratories to have greater access to students and thus have a greater opportunity of training an adequate number of properly skilled and trained national security technology employees. Faced with the prospect of decreasing budget dollars, private partnerships can be used to offset this decrease.

6.0 REFERENCES

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[i] United States Department of Energy. (2008). National Science Bowl. Retrieved January 9, 2009 from http://www.scied.science.doe.gov/nsb/index.html.

[ii] United States Department of Energy. (2008). Real World Design Challenge. Retrieved January 9, 2009 from http://www.scied.science.doe.gov/RWDC/index.html.

[iii] United States Department of Energy. (2008). Science Undergraduate Laboratory Internship. Retrieved January 9, 2009 from http://www.scied.science.doe.gov/scied/erulf/about.html.

[iv] United States Department of Energy. (2008). Community College Institute. Retrieved November 12, 2008 from htpp://www.scied.science.doe.gov/scied/CCI/about.html.

[v] United States Department of Energy. (2008). Pre-Service Teacher Internship. Retrieved November 11, 2008 from http://www.scied.science.gov/scied/PST/about.htm.

[vi] Pacific Northwest National Laboratory. (2008). Nonproliferation Graduate Program. Retrieved November 13, 2008 from htpp://ngp.pnl.gov.

[vii] United States Department of Energy. (2008). Albert Einstein Distinguished Educator Fellowship Program. Retrieved November 14, 2008 from http://www.scied.science.doe.gov/scied/Einstein/about.htm.

[viii] United States Department of Energy. (2008). Faculty and Student Teams. Retrieved November 11, 2008 from http://www.scied.science.doe.gov/scied/fast/about.html.

[ix] Ames Laboratory. (2008). Education. Retrieved November 12, 2008 from http://www.ameslab.gov/education/education.html.

[x] Argonne National Laboratory. (2008). Division of Educational Programs. Retrieved November 12, 2008 from http://www.dep.anl.gov/.

[xi] Bonneville Power Administration. (2007). Educational Programs. Retrieved November 12, 2008 from http://www.bpa.gov/corporate/education/.

[xii] Brookhaven National Laboratory. (2008). Educational Programs. Retrieved November 13, 2008 from http://www.bnl.gov/education/.

[xiii] B&W Pantex. (2008). Educational Outreach. Retrieved November 12, 2008 from http://www.pantex.com/about/news/eduOutreach/index.htm.

[xiv] Fermilab. (2008). Education. Retrieved November 11, 2008 from http://www.fnal.gov/pub/education/index.html.

[xv] Idaho National Laboratory. (2008). Education. Retrieved November 12, 2008 from https://inlportal.inl.gov/portal/server.pt?open=512&objID=264&parentname=CommunityPage&parentid=3&mode=2&in_hi_userid=200&cached=true.

[xvi] Lawrence Berkeley National Laboratory. (2008). Educational Sites. Retrieved November 11, 2008 from http://www.lbl.gov/Education/index.html.

[xvii] Lawrence Livermore National Laboratory. 2008. Science Education Program. Retrieved November 14, 2008 from https://www.llnl.gov/llnl/internships/index.jsp and http://education.llnl.gov/.

[xviii] Los Alamos National Laboratory. Students and Educators. Retrieved December 2, 2008 from http://www.lanl.gov/education/precollege/.

[xix] National Energy Technology Laboratory. (2008). Educational Initiatives. Retrieved December 2, 2008 from http://www.netl.doe.gov/education/students.html.

[xx] National Renewable Energy Program. (2008). Education Programs. Retrieved December 2, 2008 from http://www.nrel.gov/education/.

[xxi] Oak Ridge National Laboratory. (2007). Education Programs. Retrieved December 3, 2008 from http://www.ornl.gov/ornlhome/education.shtml.

[xxii] Pacific Northwest National Laboratory. (2008). Education at PNLL. Retrieved December 4, 2008 from http://science-ed.pnl.gov/students/.

[xxiii] Princeton Plasma Physics Laboratory. (2009). Science Education Program. Retrieved January 8, 2009 from http://science-education.pppl.gov/.

[xxiv] Sandia National Laboratory. (2008). Education. Retrieved December 4, 2008 from http://www.sandia.gov/ciim/ASK/ and http://www.sandia.gov/education/college/undergraduates.html.

[xxv] Savannah River Site. (2008). Educational Outreach Programs. Retrieved December 3, 2008 from http://www.srs.gov/general/outreach/edoutrch/index.htm.

[xxvi] Thomas Jefferson National Accelerator Facility. (2008). Retrieved December 5, 2008 from http://education.jlab.org/index.php.