

DEPARTMENT OF ENERGY
FY 1996 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY RESEARCH AND DEVELOPMENT

OVERVIEW

UNIVERSITY AND SCIENCE EDUCATION

GOALS AND OBJECTIVES

There is a national consensus that one of the most serious problems facing the Nation over the next several years is the declining number of Americans, including women and underrepresented, who are either pursuing careers in or have a functional knowledge of science, mathematics, engineering, and technology. This crisis in education has serious implications for the Nation's continued international, economic and technological competitiveness. The Goals 2000: Educate America Act calls for United States students to be first in the world in mathematics and science achievement, every adult American literate and possessing the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship and that the Nation's teaching force able to access programs for continued improvement of their skills and knowledge to prepare all American students for the next century.

Sustained progress towards the National Education goals is also essential if the Department of Energy is to have the scientific and technical workforce available to accomplish the Department's missions related to energy, the environment, national security and economic competitiveness. The Department historically has been both a user and a patron of a large portion of the scientific and technical workforce.

STRATEGIES

The Office of University and Science Education is the lead organization for coordinating and overseeing the Department's critical role in providing leadership to the national effort to improve mathematics, science, engineering, and technology education for all students at all levels. The FY 1996 budget request for the Office of University and Science Education program will provide continued support for a continuum of precollege through post graduate science, engineering, and mathematics education programs. These programs have two complementary strategic goals. The first goal is to encourage and support students pursuing scientific and technical degrees in fields of direct interest and relevance to the Department of Energy. This goal is achieved through a range of student research and education programs primarily conducted at the Department's national laboratories. The second goal is to assist in the national effort to improve and strengthen public literacy in science and technology. This goal is carried out through the support of

programs involving teachers, students, and adults in both formal and informal learning experiences. Special emphasis will be accorded in FY 1996 and the out years on supporting technical education activities and on leveraging long-term, systemic change through information technology and partnerships and continuous program improvement through evaluation and assessment.

PROGRAM RESPONSIVENESS

The Office of University and Science Education program consists of three major subprograms and a set of interrelated program activities which focus on the following objectives which primarily, but not exclusively, utilize the scientific and technical resources of the Department's national laboratories:

- o Promote high quality science education programs throughout the Department;
- o Increase participation of underrepresented populations in science, mathematics, engineering, and technology;
- o Contribute to systemic efforts focused on an increase in the knowledge and ability of teachers and students in science, mathematics and technology; and
- o Strengthen the capability of post-secondary faculty and students to perform long-range scientific and technology research, development and application in partnership with industry; universities and colleges, and governmental agencies.

The first Office of University and Science Education subprogram, Laboratory Cooperative Science Centers, includes support for precollege student and teacher research and training; and for the undergraduate, graduate and faculty research appointments at Department of Energy laboratories and Department of Energy business and university consortia. The FY 1996 request builds on and extends the strong base of Department involvement in science education on all levels. By FY 1996, the Department's education programs and efforts will fully reflect the change of the Department's mission with major emphasis on collaboration for economic competitiveness, alignment with the National Education Goals and the National Science and Technology Council priorities and partnerships for systemic change with Federal agencies, business and community groups to accomplish the goals of major initiatives such as technical education for school to work transition, use of educational technology as part of the information infrastructure creation and national community service. Support will be provided for national programs and systemic efforts conducted through regional partnerships with the Department Laboratories. This includes 1) summer, academic year and work study research and technical appointments for undergraduate science, engineering, and technical educators and students; 2) pre-college systemic efforts and scientific literacy. Support is requested to initiate and improve programs to meet new Administration, Department, National Education and National Science and Technology council goals and initiatives, to significantly increase participation by women and underrepresented and for dissemination of high quality programs and educational resources.

The second Office of University and Science Education subprogram, University Programs, includes support for community college, college and university-based efforts directed at encouraging more participants, including underrepresented populations and women, to pursue scientific, technical, and engineering careers needed for the economic future of the Nation. Continued cost-shared support will also be provided for the development of museum exhibitions and related classroom educational materials on Department of Energy-related scientific and technical program activities. Support is requested to continue the Department's PreFreshman Enrichment Program for 7,000 middle-school students in summer workshops on mathematics, science, and engineering conducted by universities on their campuses. Funds are requested to continue nationally competitive postdoctoral research appointments in energy-related scientific and technical disciplines and for enhanced support of Department of Energy laboratory/minority university collaborative research and education partnerships. Support is requested to fund implementation plans to improve research infrastructure in Experimental Program to Stimulate Competitive Research states. This subprogram includes: workforce analysis and assessment for the Department's education efforts done by the Department alone or in conjunction with its partners; support for post-secondary level systemic alliances to increase the number of underrepresented participants served in high quality instructional settings for contemporary and future workforce needs.

The third Office of University and Science Education subprogram, University Research Instrumentation, will provide competitive support for the acquisition of state-of-the-art research instrumentation by Department of Energy-sponsored university researchers. The University Research Instrumentation program assists the Department's energy research and technology programs by helping universities purchase instruments which cost more than \$100,000 each, and which will be utilized by a number of faculty researchers and students. University Research Instrumentation awards are made to universities based on both the merit and accomplishments of current Department of Energy-sponsored university research projects and degree to which the new equipment will enable university scientists to substantially advance understanding of energy-related phenomena.

Program Direction funding is requested for Federal staffing and associated support costs to provide overall management of the Science Education and Technical Information Program, as well as program direction and management of the Office of University and Science Education program.

Performance measures used for the Office of University and Science Education program include the number of students and educators served (including underrepresented populations) and the short- and long-term impacts of the educational efforts on the participants. These measurements will be applied to each of the subprograms.

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 ENERGY SUPPLY RESEARCH AND DEVELOPMENT
 (Tabular dollars in thousands, narrative in whole dollars)

LEAD TABLE

University and Science Education

Activity	FY 1994 Adjusted	FY 1995 Appropriation	FY 1995 Adjustment	FY 1995 Adjusted	FY 1996 Request
University and Science Education					
Operating Expenses					
Laboratory Cooperative Science Centers	\$34,158	\$35,846	\$ -5,531	\$30,315	\$30,035
University Programs	16,912	17,377	+9,705	27,082	17,377
University Reactor Fuel Assistance	3,563	3,730	-146	3,584	0 b/
University Research Instrumentation	640	5,647	0	5,647	5,647
Program Direction	<u>0</u>	<u>2,944</u>	<u>0</u>	<u>2,944</u>	<u>2,359</u>
SUBTOTAL PROGRAM	\$55,273	\$65,544	\$ 4,028	\$69,572	\$55,418
Adjustment	- <u>1,199</u> a/	- <u>730</u> a/	<u>0</u>	- <u>730</u> a/	<u>0</u>
TOTAL PROGRAM	\$54,074	\$64,814	\$ 4,028	\$68,842	\$55,418
Staffing (FTEs)	0	25	0	25	25

Authorization: P. L. 95-91, "Department of Energy Organization Act" (1977), Section 209

a/ Share of Energy Supply, Research and Development general reduction for use of prior year balances assigned to this program. The total reduction is applied at the appropriation level.

b/ Activity transferred to the Office of Nuclear Energy.

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SUMMARY OF CHANGES

University and Science Education

FY 1995 Appropriation	\$60,544
- Adjustment: Center for Minorities in Science and Engineering	+ <u>5,000</u>
FY 1995 Adjusted	65,544
- Transfer	+ <u>4,028</u>
FY 1995 Comparable	\$69,572
- Center for Minorities in Science and Engineering - One Year Program	- 5,000
- Reduced support for laboratory cooperative science center	- 280
- Reduced support for EPSCOR Program	- 4,559
- Reduced program direction support based on streamlining	- 585
- University Reactor Fuel Assistance Activity Transferred to the Office of Nuclear Energy	- <u>3,730</u>
FY 1996 Congressional Budget Request	\$55,418

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 (dollars in thousands)

KEY ACTIVITY SUMMARY

UNIVERSITY AND SCIENCE EDUCATION

I. Preface: Laboratory Cooperative Science Centers

Support is provided for precollege science students and teachers and for university faculty, graduate, and undergraduate students to participate in summer and semester-length research and education activities at Department of Energy laboratories. The objectives of this effort are to provide hands on research experience in cutting edge science thereby stimulating students to prepare for careers in science and technology fields and enhancing the knowledge and skills of teachers and faculty. The principal approach of this program takes full advantage of the unique resources and facilities at the Department of Energy laboratories for research and support of related mathematics and science education. Support is also provided in this activity element for high school science student honors research, science teacher research appointments, long-term laboratory rural/urban school partnerships workshops/institutes and other precollege science and mathematics education activities.

II. A. Summary Table: Laboratory Cooperative Science Centers

<u>Program Activity</u>	<u>FY 1994</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>\$ Change</u>
Laboratory Cooperative Science Centers	\$34,158	\$30,315	\$30,035	\$ - 280
Total, Laboratory Cooperative Science Centers	\$34,158	\$30,315	\$30,035	\$ - 280

B. Major Laboratory and Facility Funding

AMES LAB	\$ 296	\$ 427	\$ 400	\$ -27
ARGONNE NATIONAL LAB (EAST)	4,575	4,242	4,292	0
BROOKHAVEN NATIONAL LAB	2,057	2,092	2,092	0
FERMI NATIONAL ACCELERATOR LAB	1,200	1,211	1,211	0
IDAHO NATIONAL ENGINEERING LAB	157	174	174	0
LAWRENCE BERKELEY LAB	1,629	1,800	1,800	0
LAWRENCE LIVERMORE NATIONAL LAB	704	1,000	1,000	0
LOS ALAMOS NATIONAL LABORATORY	1,087	1,000	858	-142
MOUND PLANT	187	100	100	0

<u>Program Activity</u>	<u>FY 1994</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>\$ Change</u>
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION	2,503	2,500	2,500	0
OAK RIDGE NATIONAL LAB	1,098	1,150	1,150	0
PACIFIC NORTHWEST LAB	1,300	1,200	1,200	0
PRINCETON PLASMA PHYSICS LAB	371	284	289	0
SAVANNAH RIVER ECOLOGY LAB	111	100	100	0
SAVANNAH RIVER TECHNOLOGY CENTER	43	70	70	0
SANDIA NATIONAL LABORATORIES	650	650	650	0
TOTAL MAJOR LABORATORY AND FACILITY FUNDING	\$17,968	\$17,055	\$16,886	0

III. Activity Descriptions: (New BA in thousands of dollars)

<u>Program Activity</u>	<u>FY 1994</u>	<u>FY 1995</u>	<u>FY 1996</u>
Program Direction			
Science Education Program			
Direction			
Federal and Contractual Support			
Office of the Director and Office of University and Science Education			
	Funding by Object Class:		
	Personnel		
	Compensation	\$ 0	\$ 1,250
	Benefits	0	228
	Travel	0	135
	Contractual Services	0	746
		\$ 0	\$ 2,359
		\$ 1,624	
		276	
		155	
		1,734	
		\$3,789	
	Management and Direction of the Office of Science, Education and Technical Information, and Management and Administration of the University and Science Education Programs.		Continues Management and Direction of the Office of Science Education and Technical Information, and Management and Administration of the University and Science Education Programs.
	25 FTE		25 FTE
	\$ 3,789		\$ 2,359

Program Activity	FY 1994	FY 1995	FY 1996
Laboratory Cooperative Science Centers	<p>Provides for precollege and university-level student/teacher/faculty research appointments and related science education activities at Department of Energy labs. Includes summer and semester length research appointments for undergraduate students, with special emphasis on underrepresented minorities including women; and summer/academic year research appointments. Provides for consistency on the application of overhead rates to research support.</p> <p>Maintains support for national precollege-level student/teacher research appointments and related science education activities at Department of Energy labs at the FY 1993 level. Includes high school science student honors research, precollege teacher research appointments, and minority student research apprenticeships.</p> <p>Maintains support of precollege science education for the Lawrence Livermore Supercomputer Center.</p>	<p>Provides for precollege and university-level student/teacher/faculty research appointments and related science education activities at Department of Energy labs. Includes summer and semester length research appointments for undergraduate students, with special emphasis on underrepresented minorities including women; and summer/academic year research appointments. Provides for consistency on the application of overhead rates to research support.</p> <p>Maintains support for national precollege-level student/teacher research appointments and related science education activities at Department of Energy labs at the FY 1994 level. Includes high school science student honors research, precollege teacher research appointments, and minority student research apprenticeships.</p> <p>Maintains support of precollege science education for the Lawrence Livermore Supercomputer Center.</p>	<p>Provides for precollege, technical and university-level student/teacher/faculty research appointments and related science education programs at Department of Energy labs in support of the National Education Goals. Support is maintained for programs which focus on the Department's business lines and meet the Department's goals for quality, diversity, systemic reform, student, educator and public science education, educational technology and technical training.</p> <p>Program budget priorities are for systemic efforts, workforce development, science literacy, evaluation and dissemination.</p> <p>Systemic efforts include those initiatives which support partnerships focused on reforming science and math education within a state or regional system or an institution thereby maximizing</p>

Program Activity	FY 1994	FY 1995	FY 1996
Laboratory Cooperative Science Centers (Cont'd)	Continues support for Department of Energy laboratory rural/urban partnerships designed to strengthen precollege math/science education on local/regional basis.	Continues support for Department of Energy laboratory rural/urban partnerships designed to strengthen precollege math/science education on local/regional basis.	the impact of the investment. The rural/urban systemic partnerships and various teacher development programs are examples of the Department's systemic education programs.
	Provides support for 10 four-week teacher training institutes (50 teachers per institute) for middle/high school science/math teachers	Provides support for 10 four-week teacher training institutes (50 teachers per institute) for middle/high school science/math teachers	Workforce Development supports student programs designed to meet the future scientific and technical workforce requirements of the Department. Includes major commitment to increasing underrepresented populations in science and technology. Programs in this priority area provide the training and development of faculty and students from high schools, community colleges and universities through comprehensive programs which include research and training experiences at the labs. Includes support for such activities as high school honors research, community college research, apprenticeships, undergraduate summer and semester research and graduate and postgraduate support. Scientific Literacy is the program priority area which forms the foundation for citizen understanding of contemporary science issues and

Program Activity	FY 1994	FY 1995	FY 1996
Laboratory Cooperative Science Centers (Cont'd)	at Department of Energy laboratories.	at Department of Energy laboratories.	contributes to their ability to make informed decisions regarding science in their lives. Program offerings in this priority area cover the broad spectrum of methods to present science in an attractive and informative manner to a wide range of audiences including precollege student programs, public media presentations, museum exhibits and programs on energy related science, conferences and national competitions.
	No activity.	Initiates support for technology education, including initiatives in school-to-work transitions and apprenticeship programs.	Evaluation ensures the highest quality and most effective science and technical programs to meet customer requirements. Program quality in science content and instruction must model to the public the commitment to quality intrinsic to the Department scientific and technical work. Evaluation for continuous improvement and to measure impact is essential to ensure the Department's goals are met in a quality manner. Program evaluation templates have been developed for student and teacher programs at the precollege level. A template for systemic programs is under development. Evaluation has also provided a service and tools which the Department has shared with five

Program Activity	FY 1994	FY 1995	FY 1996
Laboratory Cooperative Science Centers (Cont'd)	Funding in the amount of \$500 has been budgeted for the SBIR program.	Funding in the amount of \$500 has been budgeted for the SBIR program.	<p>other Federal agencies for the evaluation of their science education programs. College level evaluation will provide information on the best methods to attract and retain under-represented populations in science, math, and technical fields.</p> <p>Dissemination as a budget priority allows for the replication of high quality science and technology education programs through electronic media or technical assistance. This approach maximizes the Department's ability to extend its resources beyond the physical setting of the Labs. Programs using Department communications technology, high performance computing and other laboratory core competencies are a unique resource to the Department to be shared with the nation.</p>
	\$ 34,158	\$ 30,315	\$ 30,035
Laboratory Cooperative Science Centers	\$ 34,158	\$ 30,315	\$ 30,035

III. Activity Descriptions: (New BA in thousands of dollars)

Program Activity	FY 1994	FY 1995	FY 1996
University Programs	<p>Continues postdoctoral fellowship program which will support ten postdoctoral research appointments in energy related scientific and technical disciplines at Department of Energy laboratories. The fellowship program will be nationally competitive.</p> <p>Supports manpower analysis efforts. Support includes funding for the collection and analysis of data on the supply and demand of scientists and engineers for current and future energy research and development programs.</p> <p>Reduces support for PREP below FY 1993 level.</p> <p>Provides continued funding for museum-based science education program at FY 1993 level.</p> <p>Continues support for Department of Energy laboratory/minority university alliances which include precollege science education activities with emphasis on underrepresented minorities at FY 1993 level.</p>	<p>Continues postdoctoral fellowship program which will support postdoctoral research appointments in energy related scientific and technical disciplines at Department of Energy laboratories. The fellowship program will be nationally competitive.</p> <p>Supports manpower analysis efforts. Support includes funding for the collection and analysis of data on the supply and demand of scientists and engineers for current and future energy research and development programs.</p> <p>Increases support for PREP.</p> <p>Provides continued funding for museum-based science education program at FY 1994 level.</p> <p>Continues support for Department of Energy laboratory/minority university alliances which include precollege science education activities with emphasis on underrepresented populations.</p>	<p>Continues postdoctoral fellowship program which will support postdoctoral research appointments in energy related scientific and technical disciplines at Department of Energy laboratories. The fellowship program will be nationally competitive.</p> <p>Supports manpower analysis efforts. Support includes funding for the collection and analysis of data on the supply and demand of scientists and engineers for current and future energy research and development programs.</p> <p>Continues support for PREP at FY 1995 level.</p> <p>Provides continued funding for museum-based science education program at FY 1995 level.</p> <p>Continues support for Department of Energy laboratory/minority university alliances which include precollege science education activities with emphasis on underrepresented populations.</p>

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 ENERGY SUPPLY RESEARCH AND DEVELOPMENT
 (dollars in thousands)

KEY ACTIVITY SUMMARY

UNIVERSITY AND SCIENCE EDUCATION

I. Preface: University Programs

Support is provided for science education and research-related efforts in areas of direct relevance to Department of Energy where universities, colleges, and other non-Department of Energy facilities are the principal performers. Support is included for: scientific and technical manpower development efforts; the collection and analysis of data on the supply and demand of scientists and engineers for current and future energy research and development programs; and summer institutes in science/math on college campuses for women and minority middle school students. Support is also provided for the development and preparation of museum-based exhibits and related educational material on energy-related science technology. Funds are requested to support a number of competitive postdoctoral research appointments in energy-related scientific and technical disciplines and for Department of Energy laboratory/minority university collaborative research and education programs.

II. A. Summary Table: University Programs

<u>Program Activity</u>	<u>FY 1994</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>\$ Change</u>
University Programs	\$16,912	\$27,082	\$17,377	\$ -9,705
Total, University Programs	\$16,912	\$27,082	\$17,377	-9,705

II. B. Major Laboratory and Facility Funding

LAWRENCE BERKELEY LAB	\$ 833	\$ 800	\$ 800	0
LOS ALAMOS NATIONAL LABORATORY	291	350	350	0
OAK RIDGE INSTITUTE FOR SCIENCE AND EDUCATION	3,001	3,000	3,000	0
OAK RIDGE NATIONAL LAB	291	350	350	0
SANDIA NATIONAL LABORATORIES	1,516	1,500	1,500	0
Total, Major Laboratory and Facility Funding	\$ 5,932	\$ 6,000	\$ 6,000	0

<u>Program Activity</u>	<u>FY 1994</u>	<u>FY 1995</u>	<u>FY 1996</u>
University Programs (Cont'd)	<p>Provides support for 10 pilot grants to retain women/minority students in math/science pipeline who are prepared to teach at precollege level.</p> <p>EPACT: EPACT Section 2203(b) "Supporting Research and Technical Analysis": Maintains the number of implementation grants awarded and supports traineeships. Funding in the amount of \$200 has been budgeted for the SBIR program.</p> <p>\$ 16,912</p>	<p>Maintains support for grants to retain women/minority students in math/science pipeline who are prepared to teach at precollege level.</p> <p>Establish a center for minorities in science, engineering, and technology at Southern University and A&M College System. (\$5,000)</p> <p>EPACT: EPACT Section 2203(b) "Supporting Research and Technical Analysis": Reduces number of implementation grants. Funding in the amount of \$300 has been budgeted for the SBIR program.</p> <p>\$ 27,082</p>	<p>No activity.</p> <p>EPACT: EPACT Section 2203(b) "Supporting Research and Technical Analysis": Supports one to two grants. Funding in the amount of \$300 has been budgeted for the SBIR program.</p> <p>\$ 17,377</p>
----- University Programs -----	----- \$ 16,912 -----	----- \$ 27,082 -----	----- \$ 17,377 -----

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KEY ACTIVITY SUMMARY

UNIVERSITY AND SCIENCE EDUCATION

I. Preface: University Reactor Fuel Assistance

Activity transferred to the Office of Nuclear Energy.

III. Activity Descriptions: (New BA in thousands of dollars)

Program Activity	FY 1994	FY 1995	FY 1996
University Reactor Fuel Assistance	<p>Provides support for university reactor refueling and funding for low enriched uranium conversion, including initial fabrication of one TRIGA reactor core.</p> <p>Funding in the amount of \$56 has been budgeted for the SBIR program.</p> <p style="text-align: right;">\$ 3,563</p>	<p>Provides support for university reactor refueling and funding for low enriched uranium conversion, including fabrication of one TRIGA reactor core.</p> <p>Funding in the amount of \$75 has been budgeted for the SBIR program.</p> <p style="text-align: right;">\$ 3,584</p>	<p>Activity transferred to the Office of Nuclear Energy.</p>
University Reactor Fuel Assistance	\$ 3,563	\$ 3,584	

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KEY ACTIVITY SUMMARY

UNIVERSITY AND SCIENCE EDUCATION

I. Preface: University Research Instrumentation

Support is provided on a competitive merit basis to universities for the purchase of state-of-the-art scientific research equipment costing more than \$100,000. The principal objective of the program is to strengthen the ability of university scientists to conduct long-range research related to the high priority Department of Energy fundamental science and energy technology research. An ancillary objective of the University Research Instrumentation program is to provide graduate students with hands-on experience in the use of sophisticated research instrumentation.

II. A. Summary Table: University Research Instrumentation

<u>Program Activity</u>	<u>FY 1994</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>\$ Change</u>
University Research Instrumentation	\$ 640	\$ 5,647	\$ 5,647	\$ 0
Total, University Research Instrumentation	\$ 640	\$ 5,647	\$ 5,647	\$ 0

III. Activity Descriptions: (New BA in thousands of dollars)

<u>Program Activity</u>	<u>FY 1994</u>	<u>FY 1995</u>	<u>FY 1996</u>
University Research Instrumentation	Provides support for 20-22 instrumentation awards.	Provides support for 22-24 instrumentation awards. Funding in the amount of \$100 has been budgeted for the SBIR program.	Provides support for 22-24 instrumentation awards. Funding in the amount of \$100 has been budgeted for the SBIR program.
	\$ 640	\$ 5,647	\$ 5,647
University Research Instrumentation	\$ 640	\$ 5,647	\$ 5,647