

DEPARTMENT OF ENERGY  
FY 1994 CONGRESSIONAL BUDGET REQUEST  
ENERGY SUPPLY, RESEARCH AND DEVELOPMENT

OVERVIEW

UNIVERSITY AND SCIENCE EDUCATION

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 young Americans, including women and minorities, indicating interest in pursuing careers in science, mathematics and engineering. This problem is further compounded by the often poor and inadequate preparation received by young students interested in such careers. The crisis in science education has serious implications for the Nation's continued international economic and technological competitiveness. Therefore, the Administration and the Governors have designated improving science and mathematics education as one of the goals for education reform by the turn of the century. This includes the goal of making U.S. students first in the world in mathematics and science achievement by the year 2000.

Future success in meeting the Department's science, energy and defense research and development (R&D) missions is also heavily dependent on the quantity and quality of the Department's scientific and technical workforce. In order to carry out these missions, DOE is both a user and a patron of a large fraction of the Nation's scientific and technical workforce. The Department and its predecessor agencies have historically supported programs designed to help replenish the Nation's scientific manpower pool, while at the same time encouraging young students to pursue scientific and technical careers in fields of direct programmatic interest to the Department. The University and Science Education (USE) Program is the primary programmatic approach used by DOE to strengthen the Nation's science education and research infrastructure to ensure their effective contribution to the Department's long-range R&D missions. Much of this support involves the use of the unique facilities and resources at the Department's national laboratories and research facilities to assist in science education from the precollege through postdoctoral levels. Specifically, the USE program consists of four major subprograms and a set of interrelated program activities which focus on the following primary objectives:

- Utilize the unique resources of the Department's laboratories (scientists, facilities and equipment) to assist in the national effort to strengthen the Nation's economic, educational and technological competitiveness by enhancing both university faculty and student research and precollege science education;
- Strengthen university capability to perform long-range R&D, including providing support for state-of-the-art research instrumentation and the refueling of university nuclear research reactors; and
- Enhance the quality and increase the numbers of young people, including minorities and women, interested in pursuing energy-related scientific/technical careers.

The first USE subprogram, Laboratory Cooperative Science Centers, includes support for precollege student and teacher research and training; and for undergraduate, graduate and faculty research appointments at DOE laboratories and DOE university consortia. The FY 1994 request builds on a historically strong base of involvement of the DOE laboratories in science education at both the precollege and university level and implements the Administration's commitment to improve mathematics and science education in the U.S. as described in the report "By The Year 2000" prepared by the Federal Coordinating Council and Science, Engineering and Technology (FCCSET) Committee on Education and Human Resources (EHR) in January 1992. Support will be provided for comprehensive programs at the national, regional and local level conducted at several DOE laboratories. This includes 1) summer and semester-length research appointments for undergraduate science and engineering students; 2) summer and academic-year appointments for university faculty and graduate students and 3) support for precollege student and teacher research appointments including the prestigious DOE High School Science Students Honors Research Program and the DOE Teacher Research Associates Program. Support is requested in the FY 1994 budget for precollege mathematics science education initiatives conducted at the DOE laboratories in response to recommendations from the Mathematics Sciences Education Board of the National Academy of Sciences. Support is requested for rural/urban school partnerships developed by the DOE laboratories in response to the recommendations of the 1989 Berkeley Math/Science Education Action Conference and in relation to the priorities developed by the FCCSET/EHR Committee. Finally, support is requested for a number of teacher training workshops/institutes for middle/high school science/math teachers at DOE and other Federal laboratories, in keeping with the number one priority developed by FCCSET/EHR

Overview - UNIVERSITY AND SCIENCE EDUCATION (Cont'd)

relative to in-service teacher enhancement.

The second USE subprogram, University Programs, includes support for university-based efforts directed at encouraging more young people, including minorities and women, to pursue energy-related scientific and technical careers as well as support for energy-related manpower analyses and assessments. Continued cost-shared support will also be provided for the development of travelling museum exhibitions and related classroom educational materials on DOE-related scientific and technical program activities. Support is requested to continue the Department's Prefreshman Enrichment Program (PREP) to involve 7,000 middle-school students in summer workshops on mathematics, science, and engineering conducted by universities on their campuses. Funds are requested for nationally competitive postdoctoral research appointments in energy related scientific and technical disciplines and support is requested for continued support of DOE laboratory/minority university collaborative research and education programs, and support is requested to fund implementation plans to improve research infrastructure in Experimental Program to Stimulate Competitive Research (EPSCOR) states and for planning agents.

The third USE subprogram, University Reactor Fuel Assistance, provides support for refueling and related activities for university nuclear research and training reactors and continuation of the conversion of university reactors to Low Enriched Uranium (LEU) fuel.

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

This budget includes \$39,800,000 in FY 1993 and \$47,200,000 in FY 1994 for the Education FCCSET initiatives.

**DEPARTMENT OF ENERGY  
 FY 1994 CONGRESSIONAL BUDGET REQUEST  
 ENERGY SUPPLY, RESEARCH AND DEVELOPMENT  
 (Tabular dollars in thousands narrative in whole dollars)**

**LEAD TABLE**

**University and Science Education**

<u>Activity</u>	<u>FY 1992 Adjusted</u>	<u>FY 1993 Appropriation</u>	<u>FY 1993 Adjustment</u>	<u>FY 1994 Request</u>
<b>Operating Expenses</b>				
Laboratory Cooperative Science Centers .....	\$25,836	\$25,563	-\$85 b/	\$35,823
University Programs .....	18,698	20,750	0	12,800
University Reactor Fuel Assistance .....	4,684	3,730	0	3,730
University Research Instrumentation .....	4,936	5,647	0	5,647
Subtotal, University and Science Education.....	<u>\$54,154 a/</u>	<u>\$55,690</u>	<u>-\$85</u>	<u>\$58,000</u>
<b>Less activities funded in Materials</b>				
Support and Other Defense Programs.....	<u>-22,400</u>	<u>-52,400</u>	<u>0</u>	<u>-58,000</u>
Subtotal, Energy Supply R&D.....	31,754	3,290	-85	0
Adjustments.....	0	0	0	0
<b>TOTAL, Energy Supply R&amp;D.....</b>	<b><u>\$31,754</u></b>	<b><u>\$3,290</u></b>	<b><u>-\$85</u></b>	<b><u>\$0</u></b>

**Authorizations:**

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

a/ Total has been reduced by \$387,000 which has been transferred to the Small Business Innovative Research program.

b/ General reduction for use of prior year balances.

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SUMMARY OF CHANGES

University and Science Education

FY 1993 Appropriation .....	\$ 55,690
- Adjustment - General reduction for use of prior year balances.....	<u>- 85</u>
FY 1993 Adjusted .....	\$ 55,605
- Increased support for base laboratory cooperative activities.....	+3,623
- Increased support for precollege and university-level student/teacher/faculty research appointments.....	+ 600
- Increase support for precollege math/science education.....	+1,450
- Increase support for rural/urban partnerships.....	+4,100
- Slight increase in support for postdoctoral fellowship program.....	+ 72
- Reduce support for EPSCoR implementation grants.....	-3,000
- Discontinue nuclear engineering research program.....	-5,000
- Discontinue reactor instrumentation upgrade program.....	-1,000
- Increase support for minority partnerships.....	+ 500
- Increase support for museum-based science education.....	+1,000
- Slight increase in manpower assessments.....	<u>+ 50</u>
 FY 1994 Congressional Budget Request .....	 <u>\$ 58,000</u>

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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 DOE 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 their teachers and faculty. The principal approach of this program takes full advantage of the unique resources and facilities at the DOE laboratories for research and support of related math/science education. Support is also provided in this activity element for high school science student honors research, science teacher research appointments, workshops/institutes and other precollege science/math education activities. All Laboratory Cooperative Science Centers activities are part of the FCCSET Education initiatives.

II. A. Summary Table: Laboratory Cooperative Science Centers

Program Activity	FY 1992 Enacted	FY 1993 Enacted	FY 1994 Request	% Change
Laboratory Cooperative Science Centers.....	\$ 25,836	\$ 25,478	\$ - 35,823	+ 41
Total, Laboratory Cooperative Science Centers	\$ 25,836	\$ 25,478	\$ 35,823	+ 41

II. B. Major Laboratory and Facility Funding

AMES LABORATORY .....	\$ 139	\$ 120	\$ 150	+ 25
ARGONNE NATIONAL LABORATORY (EAST) .....	\$ 5,391	\$ 4,413	\$ 5,800	+ 31
BROOKHAVEN NATIONAL LABORATORY .....	\$ 1,699	\$ 1,799	\$ 2,600	+ 45
FERMI NATIONAL ACCELERATOR LABORATORY .....	\$ 1,204	\$ 951	\$ 1,400	+ 47
IDAHO NATIONAL ENGINEERING LABORATORY - EG&G ....	\$ 225	\$ 100	\$ 0	-100
LAWRENCE BERKELEY LABORATORY .....	\$ 1,706	\$ 1,429	\$ 2,100	+ 47
LAWRENCE LIVERMORE NATIONAL LABORATORY .....	\$ 1,049	\$ 786	\$ 1,800	+129
LOS ALAMOS NATIONAL LABORATORY .....	\$ 979	\$ 897	\$ 1,000	+ 11
MOUND PLANT .....	\$ 129	\$ 50	\$ 140	+180
OAK RIDGE INSTITUTE FOR SCIENCE & EDUCATION .....	\$ 2,701	\$ 1,615	\$ 3,000	+ 86
OAK RIDGE NATIONAL LABORATORY .....	\$ 1,225	\$ 880	\$ 1,300	+ 48
PACIFIC NORTHWEST LABORATORY .....	\$ 900	\$ 904	\$ 1,000	+ 11
PRINCETON PLASMA PHYSICS LABORATORY .....	\$ 264	\$ 300	\$ 0	-100
SAVANNAH RIVER ECOLOGY LABORATORY .....	\$ 100	\$ 100	\$ 100	0
SAVANNAH RIVER LABORATORY .....	\$ 70	\$ 57	\$ 70	+ 23
SANDIA NATIONAL LABORATORIES .....	\$ 790	\$ 1,213	\$ 700	- 42

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

Program Activity	FY 1992	FY 1993	FY 1994
Laboratory Cooperative Science Centers			
Laboratory Cooperative Science Centers	<p>Supported precollege and university-level student/teacher/faculty research appointments and related science education activities at DOE labs maintaining graduate activities at FY 1991 level while increasing precollege and undergraduate levels by 10% over the FY 1991 level. Support included summer and semester length research appointments for undergraduate students, with special emphasis on underrepresented minorities including women; and summer/academic year research appointments.</p> <p>Supported national precollege-level student/teacher research appointments and related science education activities at DOE labs at levels increased by 30% over FY 1991. Included high school science student honors research, precollege teacher research appointments, and minority student research apprenticeships.</p> <p>Continued support for the precollege mathematics science education program at DOE laboratories.</p>	<p>Supports precollege and university level student/teacher/faculty research appointments and related science education activities at DOE laboratories. Includes summer and semester research appointments for undergraduate students, with special emphasis on underrepresented minorities including women and summer and academic year research appointments at below the FY 1992 level.</p> <p>Supports national precollege level student/teacher research appointments and related science education activities at DOE labs including the high school student honors research, precollege teacher research appointments and minority student apprenticeships at approximately 75% of the FY 1992 level.</p> <p>Support of precollege mathematics science education will be provided only for the Lawrence Livermore Supercomputing Center.</p>	<p>Provides for precollege and university-level student/teacher/faculty research appointments and related science education activities at DOE 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 DOE labs at the FY 1993 level. Includes high school science student honors research, precollege teacher research appointments, and minority student research apprenticeships.</p> <p>Continues support at the FY 1993 level for the precollege mathematics science education program at DOE laboratories.</p>

III. Laboratory Cooperative Science Centers (Cont'd):

Program Activity	FY 1992	FY 1993	FY 1994
Laboratory Cooperative Science Centers (Cont'd)	<p>Continued support for DOE laboratory rural/urban partnerships designed to strengthen precollege math/science education on local/regional basis. Partnerships include support for technical assistance from laboratory scientists to assist partnership systems in achieving long-term, systemic reform in teaching of science and mathematics. Also included support for research appointments for students/teachers at laboratories and for equipment loans and grants. Provided continued support for those partnership programs that have completed initial start-up phase.</p> <p>No activity.</p> <p>Funding in the amount of \$225 has been transferred to the Small Business Innovative Research (SBIR) program.</p>	<p>Provides support for DOE laboratory rural/urban partnerships designed to strengthen precollege math/science education on local/regional basis.</p> <p>Provides support for 10 four-week teacher training institutes (50 teachers per institute) for middle/high school science/math teachers at DOE laboratories.</p> <p>Funding in the amount of \$250 has been budgeted for the SBIR program.</p>	<p>Continues support for DOE laboratory rural/urban partnerships designed to strengthen precollege math/science education on local/regional basis.</p> <p>Provides support for 10 four-week teacher training institutes (50 teachers per institute) for middle/high school science/math teachers at DOE laboratories.</p> <p>Funding in the amount of \$537 has been budgeted for the SBIR program.</p>
	\$ 25,836	\$ 25,478	\$ 35,823
Laboratory Cooperative Science Centers	\$ 25,836	\$ 25,478	\$ 35,823

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 (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 DOE where universities, colleges and other non-DOE 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 R&D 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 ten competitive postdoctoral research appointments in energy related scientific and technical disciplines and for DOE laboratory/minority university collaborative research and education programs. University Program activities totaling \$14,322,000 in FY 1993 and \$11,377,000 in FY 1994 are part of the FCCSET Education initiatives.

II. A. Summary Table: University Programs

Program Activity	FY 1992 Enacted	FY 1993 Enacted	FY 1994 Request	% Change
University Programs.....	\$ 18,698	\$ 20,750	\$ 12,800	- 38
Total, University Programs	\$ 18,698	\$ 20,750	\$ 12,800	- 38

II. B. Major Laboratory and Facility Funding

LAWRENCE BERKELEY LABORATORY .....	\$ 833	\$ 833	\$ 800	- 4
LOS ALAMOS NATIONAL LABORATORY .....	\$ 349	\$ 329	\$ 350	+ 6
OAK RIDGE INSTITUTE FOR SCIENCE & EDUCATION .....	\$ 1,333	\$ 3,167	\$ 800	- 75
OAK RIDGE NATIONAL LABORATORY .....	\$ 349	\$ 0	\$ 350	>999
SANDIA NATIONAL LABORATORIES .....	\$ 303	\$ 1,633	\$ 300	- 82



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

Program Activity	FY 1992	FY 1993	FY 1994
University Programs			
University Programs	No activity.	Initiates postdoctoral fellowship program which will support ten postdoctoral research appointments in energy related scientific and technical disciplines at DOE laboratories. The fellowship program will be nationally competitive.	Continues postdoctoral fellowship program which will support ten postdoctoral research appointments in energy related scientific and technical disciplines at DOE laboratories. The fellowship program will be nationally competitive.
	Continued nuclear engineering research program at FY 1991 level.	Continues nuclear engineering research program at FY 1992 level.	No activity.
	Supported slightly increased manpower analyses efforts.	Continues efforts at FY 1992 level.	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 R&D programs.
	Increased number of PREP awards to 55, reaching 7,000 students.	Reduces support for PREP below the FY 1992 level.	Maintains support at FY 1993 level.
	Provided continued funding for museum-based science education program at FY 1991 level.	Delays awards in the museum-based science education program until FY 1994.	Provides continued funding for museum-based science education program at FY 1992 level.
	Provided support for DOE laboratory/minority university alliances which included precollege science education activities with emphasis on underrepresented minorities, including alliances such as the LBL/Jackson State University/Mendez Foundation, and the Science and Technology Alliance involving three DOE laboratories and three predominantly minority universities.	Maintains support for DOE laboratory/minority university alliances which include precollege science education activities with emphasis on underrepresented minorities and women at the FY 1992 level.	Continues support for DOE laboratory/minority university alliances which include precollege science education activities with emphasis on underrepresented minorities at FY 1993 level.
	Provided support for 10 pilot grants to retain women/minority students in math/science pipeline who are prepared to teach at precollege level.	Provides support for 10 additional pilot grants to retain women/minority students in math/science pipeline who are prepared to teach at precollege level.	Provides support for 10 additional pilot grants to retain women/minority students in math/science pipeline who are prepared to teach at precollege level.

III. University Programs (Cont'd):

Program Activity	FY 1992	FY 1993	FY 1994
University Programs (Cont'd)	Continued support for graduate traineeships in EPSCoR states and for continued support of state planning grants.	Supports implementation of State plans to improve research infrastructure in EPSCoR states and for planning grants.	Reduces the number of implementation grants awarded.
	Support for continuation of reactor instrumentation upgrade program was provided in the University Reactor Fuel Assistance subprogram in FY 1992.	Provides support for continuation of reactor instrumentation upgrade program.	No activity.
	Funding in the amount of \$54 has been transferred to the Small Business Innovative Research (SBIR) program.	Funding in the amount of \$393 has been budgeted for the SBIR program.	Funding in the amount of \$192 has been budgeted for the SBIR program.
	\$ 18,698	\$ 20,750	\$ 12,800
University Programs	\$ 18,698	\$ 20,750	\$ 12,800

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KEY ACTIVITY SUMMARY

UNIVERSITY AND SCIENCE EDUCATION

I. Preface: University Reactor Fuel Assistance

Provides support associated with the fabrication and shipping of nuclear fuel for university-based research/training reactors. The university-based nuclear research and manpower development effort is highly dependent on these specialized facilities, not only for nuclear related training, but also for research in the basic sciences. Support is provided through this program for the continued conversion of university reactors to low enriched uranium (LEU) fuel as mandated by the NRC. This subprogram also includes support on a competitive basis for university reactor sharing grants which provide research and training opportunities for faculty/students from nearby universities and colleges without direct access to research reactors.

II. A. Summary Table: University Reactor Fuel Assistance

Program Activity	FY 1992 Enacted	FY 1993 Enacted	FY 1994 Request	% Change
University Reactor Fuel Assistance.....	\$ 4,684	\$ 3,730	\$ 3,730	0
Total, University Reactor Fuel Assistance	\$ 4,684	\$ 3,730	\$ 3,730	0

II. B. Major Laboratory and Facility Funding

ARGONNE NATIONAL LABORATORY (EAST) .....	\$ 280	\$ 150	\$ 200	+ 33
IDAHO NATIONAL ENGINEERING LABORATORY - EG&G ....	\$ 2,776	\$ 2,095	\$ 2,900	+ 38

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

Program Activity	FY 1992	FY 1993	FY 1994
<b>University Reactor Fuel Assistance</b>			
<b>University Reactor Fuel Assistance</b>	<p>Provided support for university reactor refueling and increased funding for LEU conversion, including initiation of safety analysis reviews for future conversion of four TRIGA reactors to LEU fuel.</p>	<p>Provides support for university reactor refueling and funding for LEU conversion, including completion of safety analysis reviews for conversion of four TRIGA reactors to LEU fuel. With this level of support, completion of LEU conversion is anticipated by CY 1995.</p>	<p>Provides support for university reactor refueling and funding for LEU conversion, including initial fabrication of one TRIGA reactor core.</p>
	<p>Provided support for continuation of reactor instrumentation upgrade program.</p>	<p>Funding for continuation of this program in FY 1993 is being provided in the University Programs subprogram.</p>	<p>No activity.</p>
	<p>Funding in the amount of \$46 has been transferred to the SBIR program.</p>	<p>Funding in the amount of \$56 has been budgeted for the SBIR program.</p>	<p>Funding in the amount of \$56 has been budgeted for the SBIR program.</p>
	\$ 4,684	\$ 3,730	\$ 3,730
<b>University Reactor Fuel Assistance</b>	\$ 4,684	\$ 3,730	\$ 3,730

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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 DOE fundamental science and energy technology research. An ancillary objective of the URI program is to provide graduate students with hands-on experience in the use of sophisticated research instrumentation.

II. A. Summary Table: University Research Instrumentation

Program Activity	FY 1992 Enacted	FY 1993 Enacted	FY 1994 Request	% Change
University Research Instrumentation.....	\$ 4,936	\$ 5,647	\$ 5,647	0
Total, University Research Instrumentation	\$ 4,936	\$ 5,647	\$ 5,647	0

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

Program Activity	FY 1992	FY 1993	FY 1994
<b>University Research Instrumentation</b>			
<b>University Research Instrumentation</b>	Supported 20-22 competitively selected URI awards.  Funding in the amount of \$62 has been transferred to the SBIR program.	Provides support for 22-24 instrumentation awards.  Funding in the amount of \$85 has been budgeted for the SBIR program.	Provides support for 22-24 instrumentation awards.  Funding in the amount of \$85 has been budgeted for the SBIR program.
	\$ 4,936	\$ 5,647	\$ 5,647
<b>University Research Instrumentation</b>	\$ 4,936	\$ 5,647	\$ 5,647