

**DEPARTMENT OF ENERGY
FY 1997 CONGRESSIONAL BUDGET REQUEST
ENERGY SUPPLY, RESEARCH AND DEVELOPMENT
(Tabular dollars in thousands, Narrative in whole dollars)**

COMPUTATIONAL AND TECHNOLOGY RESEARCH

PROGRAM MISSION

The mission of the Computational and Technology Research (CTR) program is to perform long-term computational, technology, and advanced energy projects research in support of the goals of the Office of Energy Research strategic plan, and the mission of the Department of Energy (DOE).

The GOAL of the CTR program is to:

Conduct an integrated program in applied mathematical sciences, high performance computing and communications, information infrastructure, advanced energy projects research, and technology research, to address complex problems. Research in forefront and diverse programs is becoming more multidisciplinary and requires new approaches to the solution of these complex problems. The program exploits the capabilities and research skills at universities, national laboratories, and industrial research laboratories. The CTR program provides technical, analytical, and management direction for development, implementation, and evaluation of research programs that include activities from fundamental research to technology development. This includes activities such as High Performance Computing and Communications, the National Information Infrastructure, the Computational Technology program, and the joint Energy Research-Defense Programs DOE 2000 initiative. The Office of Computational and Technology Research also manages the SBIR and STTR programs, contributing additional experience and expertise to CTR program management. The program explores advanced energy concepts at an earlier stage of development than departmental energy technology programs. Technology activities include the cost-shared laboratory Cooperative Research and Development Agreements (CRADAs), technical assistance to small business and the Environmental Technology Partnerships. An effort in Intelligent Energy Processes is an important element in the integrated research program. The program works closely with other Energy Research and departmental programs.

PROGRAM MISSION - COMPUTATIONAL AND TECHNOLOGY RESEARCH (Cont'd)

The OBJECTIVES related to these goals are:

1. To **CONTRIBUTE TO SUSTAINABLE ENERGY PRODUCTION AND USE** - Conduct research that creates scientific and engineering knowledge in support of Department of Energy mission thrusts to accelerate the utilization and development of energy technologies in a safe and environmentally compatible manner.
2. To **PROVIDE WORLD CLASS COMPUTING FACILITIES** - Provide and operate major user supercomputer facilities needed for DOE research and foster research partnerships with industry and the entire scientific community. These facilities include the National Energy Research Supercomputer Center (NERSC) at Lawrence Berkeley National Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, and supercomputer centers that are essential forefront research tools that scientists and engineers use to advance knowledge and develop new products, materials, and manufacturing processes.
3. To **ENSURE THAT RESEARCH RESULTS ARE WIDELY KNOWN, VALUED and USED** - Promote open communications and the transfer of information and technology among universities, government, and the private sector. Activities include peer-review of research activities, presentation of results at meetings and in peer-reviewed scientific journals, and strong coordination and planning with the energy technology offices of the Department, collocation of researchers, input from all stakeholders, and in-depth workshops and conferences between scientists and engineers with management sponsorship and participation. The national laboratories and universities are unique resources to bring about many of these important interactions.

MAJOR ACTIVITIES:

1. Mathematical, Information, and Computational Sciences:
Supports forefront, diverse applied mathematical sciences, high performance computing, communications and information infrastructure research that spans the spectrum of activities from strategic fundamental research to technology development and demonstration.
2. Laboratory Technology Research:
Supports high risk, long-term technology research that brings research results to the stage where industry and DOE technology programs can exploit the new technologies.

PROGRAM MISSION - COMPUTATIONAL AND TECHNOLOGY RESEARCH (Cont'd)

3. Advanced Energy Projects:

Supports research to establish the feasibility of novel, high risk/high payoff energy-related concepts that span the Department's energy mission and goals.

Scientific Facilities Utilization:

The Computational and Technology Research program request includes \$28,000,000 in FY 1997 to support the NERSC. This will maintain support of the President's User Facility Initiative in FY 1996. Approximately 12% of this amount is associated with the continuation of the science user facilities initiative contained in the FY 1996 budget request. This investment will provide research time for about 5,000 scientists in universities, Federal agencies, and U.S. companies. It will also leverage both Federally and privately sponsored research, consistent with the Administration's strategy for enhancing the U.S. National science investment. The proposed funding supports the number of users served in FY 1996, which was an increase over FY 1995 levels, and will maintain the quality of service and availability of facility resources to users, including university and government scientists, as well as private companies who rely on unique facilities for their basic research needs. The proposed funding level will also provide for efficient utilization of high technology facilities, which are generally oversubscribed by factors of two to three. Research communities that will benefit from this initiative include structural biology, materials sciences, superconductor technology, medical research and technology development, plasma sciences, and environmental and atmospheric research.

PERFORMANCE MEASURES:

The Department has developed performance measures for the results of its research activities. General performance measures of program outputs for the CTR program include the number of scientists and engineers supported, the number of publications in peer-reviewed journals and the number of awards from professional organizations recognizing major achievements. Metrics for the transfer of new knowledge to a technology application include the number of cooperative agreements with industry, the number of projects resulting in support from a DOE Energy Technology program, the number of invention records and patents, and the number of users at the major computational facilities.

PROGRAM MISSION - COMPUTATIONAL AND TECHNOLOGY RESEARCH (Cont'd)

SIGNIFICANT ACCOMPLISHMENTS AND PROGRAM SHIFTS:

- o The NERSC has been recompeted to improve program efficiency and will move from Lawrence Livermore National Laboratory to Lawrence Berkeley National Laboratory in FY 1996.
- o The conclusion of a number of large scale grand challenge computer modeling projects such as the numerical Tokamak and groundwater transport will result in the refocusing of those resources to support national collaboratories and advanced computational testing and simulation.
- o The cooperative funding of the NERSC by the Fusion Energy Sciences program will be assumed by the Mathematical, Information, and Computational Sciences subprogram in FY 1997. The total FY 1997 funding for NERSC is \$28,000,000.

COMPUTATIONAL AND TECHNOLOGY RESEARCH

PROGRAM FUNDING PROFILE

(dollars in thousands)

<u>Research</u>	<u>FY 1995 Comparable Appropriation</u>	<u>FY 1996 Original Appropriation</u>	<u>FY 1996 Real & Comp. Adjustments</u>	<u>FY 1996 Comparable Adjusted</u>	<u>FY 1997 Budget Request</u>
Mathematical, Information, and Computational Sciences...	\$ 114,565	\$ -	\$ 113,140 a/	\$ 113,140	\$ 118,287
Laboratory Technology Research.....	46,539	-	17,659 b/	17,659	21,789
Advanced Energy Projects.....	10,461	-	11,643 a/	11,643	11,492
Related Capital Funding.....	4,213	-	8,056 a/	8,056	6,575
Subtotal, Computational and Technology Research.....	<u>175,778</u>	<u>-</u>	<u>150,498</u>	<u>150,498</u>	<u>158,143</u>
Adjustment.....	<u>- 1,265</u> c/	<u>-</u>	<u>- 6,141</u> c/	<u>- 6,141</u> c/	<u>-</u>
TOTAL, COMPUTATIONAL AND TECHNOLOGY RESEARCH.....	<u>\$ 174,513</u> d/	<u>\$ -</u>	<u>\$ 144,357</u>	<u>\$ 144,357</u>	<u>\$ 158,143</u>

a/ Comparability transfer in from Basic Energy Sciences and Fusion Energy Sciences.

b/ Comparability transfer in from Technology Transfer.

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

d/ Excludes \$3,472,000 which was transferred to the SBIR program and \$174,000 which was transferred to the STTR program.

Public Law Authorizations:

Public Law 95-91 "Department of Energy Organization Act" (1977)

COMPUTATIONAL AND TECHNOLOGY RESEARCH
(Dollars in thousands)

PROGRAM FUNDING BY SITE

Field Offices/Sites	FY 1995 Comparable Appropriation	FY 1996 Original Appropriation	FY 1996 Real & Comp Adjustments	FY 1996 Comparable Appropriation	FY 1997 Budget Request
Albuquerque Operations Office					
Los Alamos National Laboratory	\$14,105	\$0	\$12,907	\$12,907	\$13,763
Sandia National Laboratories	4,918	0	4,725	4,725	4,269
Chicago Operations Office					
Ames Laboratory	6,053	0	5,341	5,341	4,578
Argonne National Laboratory	20,104	0	12,551	12,551	11,558
Fermi National Accelerator Laboratory	205	0	0	0	0
Brookhaven National Laboratory	8,530	0	3,031	3,031	4,500
Princeton Plasma Physics Laboratory	425	0	0	0	0
Golden Field Office					
National Renewable Energy Laboratory	1,371	0	1,150	1,150	1,000
Idaho Operations Office					
Idaho National Engineering Laboratory	510	0	95	95	0
Oakland Operations Office					
Lawrence Berkeley National Laboratory	15,248	0	30,535	30,535	50,929
Lawrence Livermore National Laboratory	47,738	0	22,534	22,534	1,635
Stanford Linear Accelerator Center	353	0	0	0	
Oak Ridge Operations Office					
Oak Ridge Institute for Science & Education					
Oak Ridge National Laboratory	22,780	0	13,840	13,840	11,969
Continuous Electron Beam					
Accelerator Facility	669	0	150	150	180
Richland Operations Office					
Pacific Northwest National Laboratory	8,510	0	3,465	3,465	4,400
All Other Sites	24,259	0	40,174	40,174	49,362
Subtotal	175,778	0	150,498	150,498	158,143
Adjustment	-1,265 a/		-6,141	-6,141 a/	0
TOTAL	\$174,513	\$0	\$144,357	\$144,357	\$158,143

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

**COMPUTATIONAL AND TECHNOLOGY RESEARCH
PROGRAM OBJECT CLASS SUMMARY
(Dollars in thousands)**

	FY 1995		FY 1996		FY 1997
	Comparable	Non-Comp	Comparable	Non-Comp.	
Direct Funding:					
Personnel compensation:					
11.1 Full-time permanent.....					
11.3 Other than full-time permanent.....					
11.5 Other personnel compensation.....					
11.8 Special personal services payments.....					
11.9 Total personnel compensation.....	0	0	0	0	0
12.1 Civilian personnel benefits					
13.0 Benefits for former personnel.....			1,500		
21.0 Travel and transportation of persons.....					
22.0 Transportation of things.....					
23.1 Rental payments to GSA.....					
23.2 Rental payments to others.....					
23.3 Communications, utilities, and miscellaneous charges.....					
24.0 Printing and reproduction.....					
25.1 Advisory and assistance services.....	332		450		600
25.2 Other services.....	2,891		12,518		22,975
25.3 Purchases of goods and services from Government accounts.....					
25.4 Operation and maintenance of facilities	147,288		103,375		103,693
25.5 Research and development contracts.....					
25.7 Operation and maintenance of equipment.....					
26.0 Supplies and materials.....					
31.0 Equipment.....	4,213		7,704		6,575
32.0 Land and structures.....					
41.0 Grants, subsidies and contributions.....	19,582		19,000		24,300
99.0 Subtotal, obligations.....	174,306	0	144,547	0	158,143
Reimbursable Obligations.....	-	-	-		
99.9 Total Obligations.....	174,306	0	144,547	0	158,143
Recovery of prior year obligations.....	10		-9		
Unobligated balance avail, start of year.....	-43		-181		
Unobligated balance avail, end of year.....	240				
Budget Authority.....	<u>\$174,513</u>	<u>\$0</u>	<u>\$144,357</u>	<u>\$0</u>	<u>\$158,143</u>

COMPUTATIONAL AND TECHNOLOGY RESEARCH

MATHEMATICAL, INFORMATION, AND COMPUTATIONAL SCIENCES

(Tabular dollars in thousands, Narrative in whole dollars)

I. Mission Supporting Goals and Objectives:

The Mathematical, Information, and Computational Sciences (MICS) subprogram is a forefront, diverse applied mathematical sciences, high performance computing, communications and information infrastructure program that spans the spectrum of activities from strategic fundamental research to technology development and demonstration. The diverse activities supported by this program are integrated to support two major strategic thrusts: National Collaboratories (NC) and Advanced Computational Testing and Simulation (ACTS). The thrust in National Collaboratories is developing a set of tools and capabilities that will permit scientists and engineers working at different DOE and other facilities to collaborate on solving problems as easily as if they were in the same building. The thrust in Advanced Computational Testing and Simulation is developing an integrated set of algorithms, software tools and infrastructure that will enable computer simulation to better complement experiment and theory or to be used in place of experiments when real experiments are too dangerous, expensive, or inaccessible. These two strategic thrusts support the underlying mathematical concepts and information technology needs of all DOE mission areas (e.g., Fundamental Research, Defense, Energy Efficiency, Environmental and Fossil programs, etc.). The efforts in these areas are closely coordinated with related activities supported by Defense Programs.

The FY 1997 request includes initial funding for the DOE 2000 initiative. This is a joint Energy Research - Defense Programs effort to develop and test a common technology base that supports both National Collaboratories and Advanced Computational Testing and Simulation. Efforts are underway to extend the DOE 2000 initiative to other DOE programs and other agencies as it matures.

The MICS subprogram also supports and responds to the Energy Policy Act (EPACT) and to the High Performance Computing Act of 1991 and provides supercomputer access and advanced communication capabilities, through the Energy Sciences Computer Network (ESnet), to scientific researchers. Finally, the MICS subprogram also serves as an advocate within the Department to formulate and coordinate the Department's National Information Infrastructure (NII) initiative, especially to promote economically beneficial energy-related "National Challenges" applications such as energy demand and supply management and to develop the underlying technologies to enable these applications.

III. Performance Summary: MATHEMATICAL, INFORMATION, AND COMPUTATIONAL SCIENCES (Cont'd)

Performance measures for ACTS include the number of new mathematical algorithms and approaches developed for DOE mission critical application areas, the scope, completeness, and breadth of application of the ACTS software framework, and the acceptance by scientific computing users of ACTS tools. Performance measures for NC include the number of sites supplied with upgraded ESnet services, the scope of deployment of the ESnet-wide security architecture, the number of groups provided with tools for remote access to experimental facilities, and the number of new remote collaboration tools developed and deployed.

II. Funding Schedule:

<u>Program Activity</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>FY 1997</u>	<u>\$ Change</u>	<u>% Change</u>
Mathematical, Computational, and Computer Sciences Research...	\$ 51,143	\$ 51,240	\$ 50,398	\$- 842	- 1.6%
Advanced Computation, Communications, and Associated Activities.	<u>63,422</u>	<u>61,900</u>	<u>67,889</u>	<u>+ 5,989</u>	<u>+ 9.7%</u>
Total, Mathematical, Information, and Computational Sciences.	<u>\$114,565</u>	<u>\$113,140</u>	<u>\$118,287</u>	<u>\$+ 5,147</u>	<u>+ 4.5%</u>

III. Performance Summary:

FY 1995 Accomplishments:

- o Upgraded ten sites on the Energy Sciences Network (ESnet) to Asynchronous Transfer Mode (ATM) service to improve performance.
- o Developed prototype software to allow remote access to Advanced Light Source experiments across ESnet.
- o Coordinated definition of a National Collaboratory framework that could be used for both open and secure National Collaboratories.

III. Performance Summary: MATHEMATICAL, INFORMATION, AND COMPUTATIONAL SCIENCES (Cont'd)

- o Developed new algorithms for improved simulation of compressible fluid dynamics for use in combustion research, groundwater transport, global climate, and weapons simulations.
- o Conducted the largest molecular dynamics simulation in history (1 billion atoms).
- o Initiated an interagency project with the Advanced Research Project Agency, the National Aeronautics and Space Administration, and the National Science Foundation on improved Input/Output (I/O) software for massively parallel computers to address a critical issue in the maturation of these technologies.
- o Developed two new virtual reality (VR) paradigms for understanding complex scientific data such as materials structures that improve the speed with which scientists can understand results by at least a factor of 10.
- o Funding in the amount of \$2,146,000 and \$107,000 was transferred to the SBIR and STTR programs, respectively.

FY 1996 Accomplishments (to date and planned):

- o Upgrade an additional ten sites on ESnet to ATM services.
- o Deploy ESnet-wide security architecture and security tools.
- o First test of virtual environments linked across a wide area network.
- o First deployment to users of software developed to allow remote access to Advanced Light Source experiments across ESnet.
- o Coordinate definition (with DOE Defense Programs) of the interfaces that allow new collaborative tools to be incorporated into National Collaboratory framework.
- o Add security, privacy, and resource reservation to DOE workstation video/audio and other remote collaboration software.
- o Initiate deployment of massively parallel computer in supercomputer access program.

iii. Performance Summary: MATHEMATICAL, INFORMATION, AND COMPUTATIONAL SCIENCES (Cont'd)

- o Establish interoperability of virtual reality technologies to explore domains of most advantageous use of these two technologies.
- o Coordinate definition (with DOE Defense Programs) of the interfaces that allow new ACTS tools to be incorporated into a unified ACTS toolkit.
- o Deploy advanced scientific data management technologies to scientific users.
- o Evaluate strategies for producing large applications software packages that can be executed in environments ranging from networks of workstations to the highest performance massively parallel processors available.
- o Funding in the amount of \$2,044,000 and \$153,000 has been budgeted for the SBIR and STTR programs, respectively.

FY 1997 Planned Accomplishments:

- o Upgrade ESnet bandwidth services to support high speed Program Integration and ACTS applications as part of the DOE 2000 initiative.
- o Integrate existing collaborative tools into National Collaboratory framework.
- o Implement advanced technologies for information security to support flexible administration of resources.
- o Production deployment of remote access software to a number of experimental groups.
- o Address issues of navigation and context in National Collaboratories.
- o Begin preparing one additional DOE experimental facility for remote access.
- o Full deployment of massively parallel computer in supercomputer access program.
- o Integrate most critical existing software tools into ACTS framework as part of the DOE 2000 initiative.

III. Performance Summary: MATHEMATICAL, INFORMATION, AND COMPUTATIONAL SCIENCES (Cont'd)

- o Begin development of ACTS-enabled applications development in compressible fluid dynamics/combustion, environmental chemistry, and materials sciences. (This effort is coordinated, as part of the DOE 2000 initiative, with parallel development in DOE Defense Programs of ACTS-enabled applications in weapons hydrodynamics and materials characterization and aging.)
- o Funding in the amount of \$2,957,000 has been budgeted for the SBIR program.

Explanation of Funding Changes FY 1996 to FY 1997:

The net increase in funding (\$+5,147,000) is due to enhanced efforts in National Collaboratories and Advanced Computational Testing and Simulation in support of the DOE 2000 initiative.

COMPUTATIONAL AND TECHNOLOGY RESEARCH

LABORATORY TECHNOLOGY RESEARCH **(Tabular dollars in thousands, Narrative in whole dollars)**

I. Mission Supporting Goals and Objectives:

The Laboratory Technology Research subprogram conducts technology research projects in support of Office of Energy Research (ER) goals, as defined by the strategic plan, to reduce technical risk associated with a technology or process development. The program links the basic science at ER national laboratories to applied technologies through leveraged collaborations with industries. The program is focused in critical technology research areas, e.g., intelligent manufacturing processes, tailored materials, and sustainable environments, to contribute technological innovations that will stimulate national economic growth, and to increase the return on the government investment in basic science. For example, research on intelligent processes such as sensor-computer-machine control systems will focus on high risk technological problems for ultimate commercial applications with high payoff. The potential for large payoff is based on the explosive growth in inexpensive computer technologies and the ability to incorporate them into control systems.

Research is conducted through peer-reviewed collaborations, including cost-shared Cooperative Research and Development Agreements (CRADAs), personnel exchanges, technology research and maturation projects, technical assistance/consultations to small business, and major government-industry partnerships with multiple partners.

Performance measures related to laboratory technology research focus on reduction of technical risk. The quality of research is evaluated through peer review, workshops, and site visits. The impact of research output must be assessed in terms of quality of new knowledge gained, its usefulness to subsequent technology development, and its longer term benefit to society. Quantitative performance measures include the level of small business access to ER laboratory expertise, the level of industry cost share, and the number of projects resulting in support from other programs or industry.

II. Funding Schedule:

<u>Program Activity</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>FY 1997</u>	<u>\$ Change</u>	<u>% Change</u>
Laboratory Technology Research	\$ 46,539	\$ 17,659	\$ 21,789	\$+ 4,130	+ 23.4%
Total, Laboratory Technology Research .	<u>\$ 46,539</u>	<u>\$ 17,659</u>	<u>\$ 21,789</u>	<u>\$+ 4,130</u>	<u>+ 23.4%</u>

III. Performance Summary:

FY 1995 Accomplishments:

- o Continued 62 ongoing multi-year collaboration projects, with 61 new starts.
- o Increased technical assistance provided to the entrepreneurial small business sector.
- o Increased support for seven AMTEX Partnership projects, with one new start.
- o Streamlining of the program and delegation of the merit review process to the laboratories resulted in reduction in CRADA processing time by 50%.
- o Concentration of partnerships in laboratory core competencies increased the benefit back to the Department's public missions.
- o Environmental research accomplishments included improved treatment processes for toxic metals in ash, recovery of industrial acids for reuse, hazardous waste destruction, and biological treatments for both soil and water remediation.
- o Improved DNA sequencing by gel electrophoresis will contribute major cost savings and cut screening times for the Human Genome Project, and for other biomedical and agricultural research projects.
- o Improved methodologies for materials characterization, modeling and forming of complex parts, and reduced manufacturing and assembly costs.
- o A new coating was developed to protect and extend the life of computer hard disk drives.
- o Developed a Variable Frequency Microwave Furnace which was subsequently commercialized and is now being used by DOE researchers to explore innovative methods to break down toxic wastes.

III. Performance Summary: LABORATORY TECHNOLOGY RESEARCH (Cont'd)

- o Developed new techniques for the cost-effective machining of ceramics and high-temperature metallic systems that will improve our ability to economically prepare complex parts for harsh environments.
- o Funding in the amount of \$1,112,000 and \$56,000 was transferred to the SBIR and STTR programs, respectively.

FY 1996 Accomplishments (to date and planned):

- o Continue support for 90 ongoing multi-year collaboration projects at 5 Energy Research multi-program laboratories (Argonne National Laboratory, Oak Ridge National Laboratory, Brookhaven National Laboratory, Lawrence Berkeley National Laboratory, and Pacific Northwest National Laboratory). No new starts.
- o Continue technical assistance/consultations to small businesses.
- o Decrease support for the AMTEX Partnership with closure of three projects.
- o Eliminate Technology Research activities at five ER single program laboratories (Fermi National Accelerator Laboratory, Ames Laboratory, Princeton Plasma Physics Laboratory, Continuous Electron Beam Accelerator Facility, and Stanford Linear Accelerator Center).
- o Funding for severance costs associated with the Technology Partnership Program.
- o Funding in the amount of \$306,000 and \$23,000 has been budgeted for the SBIR and STTR programs.

FY 1997 Planned Accomplishments:

- o Continue support for 90 ongoing multi-year collaboration projects in technology research focus areas at 5 ER multi-program laboratories. Includes increased support for intelligent energy processes and computational technology.
- o Continue technical assistance/consultations for small businesses.
- o Eliminate support for the AMTEX Partnership.
- o Funding in the amount of \$545,000 has been budgeted for the SBIR program.

III. Performance Summary: LABORATORY TECHNOLOGY RESEARCH (Cont'd)

Explanation of Funding Changes FY 1996 to FY 1997:

- o Increased support for Computational Technology projects (+\$3,000,000).
- o Increased support for ongoing multi-year laboratory collaborative projects in technology focus areas including intelligent processes (+\$3,217,000).
- o Increased support for technical assistance activities (+\$2,413,000).
- o Decrease associated with one-time severance costs in FY 1996 (-\$1,500,000).
- o Eliminate support for the AMTEX Partnership (-\$3,000,000).

COMPUTATIONAL AND TECHNOLOGY RESEARCH

ADVANCED ENERGY PROJECTS

(Tabular dollars in thousands, Narrative in whole dollars)

I. Mission Supporting Goals and Objectives

This activity funds research to establish the feasibility of novel, energy-related concepts that span the Department's energy mission and goals. These concepts are usually derived from recent advances in basic research, but require additional research to establish their feasibility. A common theme for each concept is the initial linkage of new, or previously neglected, research results to a practical energy payoff for the Nation. Efforts are typically supported at a level of \$300,000 per year for a period of 3 years. Although the funding profile can vary widely among projects in the Advanced Energy Projects (AEP) research portfolio, the 3-year budget period is considered a maximum. A measure of success is demonstrated if the project attains further funding from another source to realize its full potential. Projects are selected from proposals submitted by universities, industrial organizations, non-profit research institutions, and national laboratories. Equal consideration is given to each submission. Funding criteria include scientific merit as judged by peer review.

II. Funding Schedule:

<u>Program Activity</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>FY 1997</u>	<u>\$ Change</u>	<u>% Change</u>
Advanced Energy Projects	<u>\$ 10,461</u>	<u>\$ 11,643</u>	<u>\$ 11,492</u>	<u>\$- 151</u>	<u>- 1.3%</u>
Total, Advanced Energy Projects	<u>\$ 10,461</u>	<u>\$ 11,643</u>	<u>\$ 11,492</u>	<u>\$- 151</u>	<u>- 1.3%</u>

III. Performance Summary:

FY 1995 Accomplishments:

- o Developed a novel optical method for mapping oil and gas reservoirs.
- o Discovered a technique, using plasma physics, for removing pollutants from diesel engine exhaust gases.

III. Performance Summary: ADVANCED ENERGY PROJECTS (Cont'd)

- o Conducted research that could lead to a method for the rapid, but sensitive, determination of the structural integrity of materials in a nuclear reactor environment.
- o Funding in the amount of \$214,000 and \$11,000 was transferred to the SBIR and STTR programs, respectively.

FY 1996 Accomplishments (to date and planned):

- o Apply novel materials to a high-efficiency, CFC-free refrigeration technique.
- o Explore the feasibility of electrically controlled thin films for windows with adjustable tint.
- o Investigate a new material that emits blue laser light for a variety of possible applications, including energy-efficient displays.
- o Funding in the amount of \$224,000 and \$17,000 has been budgeted for the SBIR and STTR programs, respectively.

FY 1997 Planned Accomplishments:

- o Develop a novel, and potentially highly-efficient approach for converting methane into heat and a new magnetic material that can be fabricated with small feature sizes for use as micromotors.
- o Conduct research on the synthesis and characterization of new materials for energy-efficient, optical imaging.
- o Explore research on a solar-powered technique for converting carbon dioxide to methanol.
- o Initiate new projects in emerging scientific and technical areas consistent with the priorities of the Office of Energy Research and the Department of Energy mission.
- o Funding in the amount of \$287,000 has been budgeted for the SBIR program.

III. Performance Summary: ADVANCED ENERGY PROJECTS (Cont'd)

Explanation of Funding Changes FY 1996 to FY 1997:

Research will continue at a slightly decreased level (\$-151,000).

COMPUTATIONAL AND TECHNOLOGY RESEARCH
RELATED CAPITAL FUNDING
(Tabular dollars in thousands, Narrative in whole dollars)

I. Mission Supporting Goals and Objectives:

The Related Capital Funding subprogram funds Capital Equipment in support of the CTR research program.

II. Funding Schedule:

<u>Program Activity</u>	<u>FY 1995</u>	<u>FY 1996</u>	<u>FY 1997</u>	<u>\$ Change</u>	<u>% Change</u>
Capital Equipment	<u>\$ 4,213</u>	<u>\$ 8,056</u>	<u>\$6,575</u>	<u>\$- 1,481</u>	<u>- 18.4%</u>
Total, Related Capital Funding.	<u>\$ 4,213</u>	<u>\$ 8,056</u>	<u>\$6,575</u>	<u>\$- 1,481</u>	<u>- 18.4%</u>

III. Performance Summary:

FY 1995 Accomplishments:

- o Supported equipment related to High Performance Computing and Communications activities and Advanced Energy Projects such as workstations, small networking equipment, and supercomputer peripheral items.

FY 1996 Accomplishments (to date and planned):

- o Support equipment related to High Performance Computing and Communications activities and Advanced Energy Projects such as workstations, small networking equipment, and supercomputer peripheral items.
- o Purchase network hardware for the National Energy Research Supercomputer Center at LBNL in the amount of \$2,000,000.
- o Purchase high speed disks for storage systems at the National Energy Research Supercomputer Center at LBNL in the amount of \$2,000,000.

III. Performance Summary: RELATED CAPITAL FUNDING (Cont'd)

FY 1997 Planned Accomplishments:

- o Support equipment related to High Performance Computing and Communications and Advanced Energy Projects such as workstations, small networking equipment, and supercomputer peripheral items.
- o Purchase advanced file computer storage hardware at the National Energy Research Supercomputer Center at LBNL in the amount of \$2,000,000.

Explanation of Funding Changes FY 1996 to FY 1997:

Decreased funding results from the one-time purchase in FY 1996 of data storage hardware and high speed disk drives in support of the National Energy Research Supercomputer Center at LBNL (\$-1,481,000).

**COMPUTATIONAL AND TECHNOLOGY RESEARCH
CAPITAL OPERATING EXPENSES AND CONSTRUCTION SUMMARY
(Dollars in thousands)**

	<u>FY 1995</u>	<u>FY 1996</u>	<u>FY 1997</u>	<u>\$ Change</u>	<u>% Change</u>	
Capital Operating Expenses						
Capital Equipment (total).....	\$4,213	\$8,056	\$6,575	-\$1,481	-18.4%	
	<u>TEC</u>	<u>Previous Appropriated</u>	<u>FY 1995 Appropriated</u>	<u>FY 1996 Appropriated</u>	<u>FY 1997 Request</u>	<u>Acceptance Date</u>
Major Items of Equipment (CE \$2 million and above & ADP MIE's \$1 million and above)						
1. Machine Room Aux. Services and Network - LBNL	\$2,000	\$0	\$0	\$2,000	\$0	4/96
2. Storage Systems - LBNL	2,000	0	0	2,000	0	3/96
3. Archival Systems Upgrade - LBNL	2,000	0	0	0	2,000	4/97