Executive Budget Summary

Mission

The Office of Nuclear Energy, Science and Technology (NE) is responsible for leading the Federal government's investment in nuclear science and technology. Our mission is to support innovative applications of nuclear technology that will benefit society. To develop these applications and reap their attendant benefits, Federal and private investments must not simply be made in response to the issues of the day, but to those that are most likely to emerge within the next 10 to 20 years.

The Nation's use of and need for nuclear technologies will increase in the coming years. Nuclear energy is the only expandable, large-scale electricity source that avoids air emissions and meets the energy demands of a growing, modern economy. Nuclear energy produces electricity without emissions of greenhouse gases or other pollutants, and thus can play an important role in the U.S. and international response to potential long-term climate effects caused by still-growing emissions of carbon dioxide. The opening to competition of energy markets in the United States and Europe and the growth of energy markets in Asia and developing countries has created major new business opportunities for the U.S. nuclear industry and employment opportunities for American workers. And in the realm of medicine, radioisotopes play a major and growing role.

Climate change may prove, in the long term, to be the most important strategic driver of all. The success of the U.S. effort to reduce emissions of carbon dioxide and related gases rests upon the continuing operation of our nation's nuclear power plants.

To prepare for the future, the Department has successfully refocused, reformed, and opened to outside advice its research program. For example, in October 1998, Secretary of Energy Richardson established the Nuclear Energy Research Advisory Committee (NERAC), to provide advice to the Department on the direction of our nuclear technology and research programs in the 21st century. This committee, chaired by Dr. James Duderstadt, former president of the University of Michigan, is comprised of 28 eminent senior policy, science and technology experts from academia, industry and our national laboratories. The membership of this committee is diverse, including an environmental advocate, senior officials from industry, researchers in nuclear medicine, laboratory directors, and a former member of the U.S. Senate.

NE's FY 2001 budget request reflect NERAC's advice recognizes that increased funds for nuclear research, development, and educational programs are essential to supporting national nuclear energy programs. In July 1999, the NERAC Subcommittee on Long Term Planning for Nuclear Energy Research recommended that the Department request an increase of funding to $40 million for the Nuclear Energy Research Initiative (NERI) in FY 2001 in order to support existing R&D and an additional $10 million specifically for international R&D. They also advised the Department to increase the Nuclear Energy Plant Optimization (NEPO) program to $10 million in FY 2001, $5 million higher than its FY 2000 inaugural year. Furthermore, NERAC has established a subcommittee that has taken the lead in developing a comprehensive assessment of our nuclear science and technology infrastructure. Pending the outcome of this assessment, NE's budget request reflects the Department's commitment to

ensure the availability of our unique nuclear research facilities. In addition to these activities, NERAC has served other active subgroups now investigation the following topics:

- # long-term isotope research and production;
- # operating nuclear power plant research coordination and planning;
- # accelerator transmutation of waste;
- # the future of university nuclear engineering and research reactors; and
- # technology opportunities for increasing proliferation resistance

As in previous years, our request is linked to the latest draft of the DOE Strategic Plan. NE's many diverse programs contribute to the success of the Department's business line goals. Working with industry, academia, the national laboratories, other Government agencies, and international partners, the Office has established goals that derive from the Department's strategic plan and guide our day-to-day activities. NE's goals by DOE Objective follow:

- # *Energy Resources Objective 2* - Promote reliable, affordable electricity supplies that are generated with acceptable environmental impacts.
  - < Support innovative nuclear energy research and science (see Nuclear Energy Research Initiative)
  - < Address critical technology issues associated with existing nuclear power plants (see Nuclear Energy Plant Optimization)

- # *Science Objective 2* - Protect our living planet with scientific understanding of energy impacts on people and the biosphere.
  - < Develop technologies for production and application of isotopes; support vital, advanced research that applies to the Department’s isotopes; and ensure a reliable supply of medical, research, and industrial isotopes (see Isotopes Support)

- # *Science Objective 4* - Provide the extraordinary tools, scientific workforce, and infrastructure that assure our Nation’s leadership in the physical, biological, and computational sciences and in multidisciplinary research.
  - < Provide compact, safe, reliable nuclear power systems and related technologies to space, national security, and other customers (see Advanced Radioisotope Power Systems)
  - < Support improved U.S. nuclear engineering education and research infrastructure (see University Reactor Fuel Assistance and Support)
  - < Manage DOE nuclear facilities in a safe, environmentally-sound, and cost effective manner and provide for the easy, cost-efficient use of relevant facilities by non-Federal researchers (see Test Reactor Area Landlord)
  - < Develop technologies for production and application of isotopes; support vital, advanced research that applies to the Department’s isotopes; and ensure a reliable supply of medical, research, and industrial isotopes (see Isotopes Support)
  - < Develop technologies needed to meet DOE spent nuclear fuel management and facility shutdown commitments (see Termination Costs)

Environmental Quality Objective 5 - Manage the material and facility legacies associated with the Department's uranium enrichment activities.

- < Address facility and environmental legacies associated with the uranium enrichment program, management of government assets, and associated research and development (see Uranium Programs)

Environmental Quality Objective 6 - Improve scientific understanding and develop and deploy innovative technologies that reduce cost; are more protective of workers, the public, and the environment; and resolve currently intractable problems.

- < Support the development of technology for the amelioration of commercial reactor spent nuclear fuel (see Civilian Research and Development (ATW))
- < Develop technologies needed to meet DOE spent nuclear fuel management and facility shutdown commitments (see Termination Costs)
- < Support implementation of the Secretary's August 1999 decision regarding future operation of FFTF for the future production of medical and industrial radioisotopes and other nuclear research and irradiation activities or permanent deactivation (see Fast Flux Test Facility)

Strategy

In accomplishing its program mission, the Office of Nuclear Energy, Science and Technology will engage research institutions in industry, U.S. universities, national laboratories, international organizations, and other countries in cooperative and collaborative efforts. The major program elements that contribute to the mission are: Advanced Radioisotope Power Systems, University Reactor Fuel Assistance and Support, Test Reactor Area Landlord, Nuclear Energy Plant Optimization, Nuclear Energy Research Initiative, Civilian Research and Development (ATW), Termination Costs, Fast Flux Test Facility, Isotope Support, Uranium Programs, and Program Direction. Program accomplishments that will enable NE to achieve it's mission are identified in the detailed program budget submissions. Programs that make up the NE budget are appropriated in the Energy Supply account.

Funding Summary

(dollars in thousands)

	FY 1999 Current Appropriation	FY 2000 Original Appropriation	FY 2000 Adjustments	FY 2000 Current Appropriation	FY 2001 Request
Energy Supply					
Nuclear Energy R&D	73,103	92,000	-632	91,368	92,200
Termination Costs	84,470	80,000	-1,225	78,775	74,000
Fast Flux Test Facility	30,000 [a]	28,000	0	28,000	44,010
Isotope Support	21,500	20,500	-45	20,455	17,215
Uranium Programs	50,790 [b]	43,500	-1,555	41,945	53,400
Program Direction	24,700 [c]	24,700	0	24,700	27,620
Use of Prior Year Balances	-5,475	0	-170	-170	0
Offset from Revenue	0	0	0	0	-2,352
Total, Energy Supply	279,088	288,700	-3,627	285,073	306,093

Major Changes

In FY 2000, Congress directed the Department to pursue ATW technology development. Congress provided $9 million to the Office of Nuclear Energy, Science and Technology (NE) under the Civilian Research and Development decision unit, to establish the ATW program in FY 2000. In the first year of the program, systems studies will begin in order to establish and evaluate a broad range of technology options and narrow the choices. For FY 2001, the Department has requested no new funds for ATW research. While the Roadmap prepared by the Department last year provides a good basis to begin the program planning process, the Department plans to apply the funds provided for FY 2000 to complete critical trade studies (focusing on subjects such as the viability of lead-bismuth coolants), evaluate experimental data from test facilities in the U.S. and Russia and complete its detailed program plan. Once this is done, the program will be well equipped to suggest the next stage of research. Once the program plan and its recommendations are prepared and have been reviewed by the NERAC, Nuclear Energy will submit it for consideration by DOE management, the Office of Management and Budget, the Office of Science and Technology Policy, and interested Congressional committees.

[a] Excludes $9.2 million of prior year balances reprogrammed into this account in FY 1998.

[b] Includes $13.58 million for Transparency Measures which transferred to the Office of Nonproliferation and National Security.

[c] Includes $3.458 million for Salaries, Benefits, Travel and administrative expenses associated with the International Nuclear Safety Program and Transparency Measures which transferred to the Office of Nonproliferation and National Security.

Major Issues

None

Site Funding

Site funding is provided in individual decision units.

Program Performance Measures

Key program performance measures used to judge the effectiveness of each program element are shown below. In addition to the technical effectiveness measures shown, program progress, customer satisfaction, and employee satisfaction are monitored to ensure that NE's programs are relevant and managed in a cost-effective manner.

Advanced Radioisotope Power Systems (SC-4)

In FY 2000, execute industrial contract and initiate associated laboratory efforts to develop small Radioisotope Thermoelectric Generators (RTGs) for anticipated use on NASA's Europa Orbiter and Pluto/Kuiper missions planned for launch in 2003 and 2004.

In FY 2000, complete bench scale demonstration of the process to recover Pu-238 scrap for reuse in power systems for future missions using radioisotope power systems.

In FY 2001, bring Pu-238 scrap recovery line to full operation and process two kilograms of Pu-238 scrap for reuse in ongoing missions requiring the use of radioisotope power systems.

In FY 2001, complete final design and initiate fabrication of small Radioisotope Thermoelectric Generators (RTGs) for anticipated use on NASA's Europa Orbiter and Pluto/Kuiper missions planned for launch in 2003 and 2004.

University Reactor Fuel Assistance and Support (SC-4)

Support U.S. universities' nuclear energy research and education capabilities by:
  - < Providing fresh fuel to all university reactors requiring this service.
  - < Funding universities with research reactors for reactor upgrades and improvements (21 in FY 1999; and approximately 23 reactors each year in FY 2000 and FY 2001).
  - < Partnering with private companies to fund DOE/Industry Matching Grants Program for universities (21 in FY 1999; and 17 or more each year in FY 2000 and FY 2001).
  - < Increasing the funding for Reactor Sharing in FY 1999 by 40 percent over FY 1998, and in FY 2000 and FY 2001 continue support, enabling each of the 29 schools eligible for the program to improve the use of their reactors for teaching, training, and education within the surrounding community.

Attract outstanding U.S. students to pursue nuclear engineering degrees by:
  - < Providing fellowships (22 in FY 1999 and 22-24 each year in FY 2000 and FY 2001).
  - < Increasing the number of Nuclear Engineering Education Research Grants (in FY 1999 existing and new grants will total 39; and in FY 2000 and FY 2001 existing and new grants will total approximately 45).
  - < Providing Scholarships and summer on-the-job training to sophomore, junior and senior nuclear engineering and science scholarship recipients (29 junior/senior and 38 sophomore for a total of 67 in FY 1999; and approximately 50 each year in FY 2000 and FY 2001) .

Test Reactor Area Landlord (SC-4)

Continue to upgrade the physical plant and site infrastructure in accordance with the long range plan to ensure safe and reliable operation of Test Reactor Area site facilities.

Nuclear Energy Plant Optimization (ER-2)

In FY 1999, completed Memoranda of Understanding with the Nuclear Regulatory Commission (NRC) and the Electric Power Research Institute (EPRI) to guide future implementation of the Joint DOE-EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants.

In FY 2000, implement a cooperative cost-shared R&D program by working with industry, universities, national laboratories, and the Nuclear Regulatory Commission, to address technical issues that could prevent continued operation of current nuclear power plants.

In FY 2000, issue the first update to the Joint DOE/EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants.

In FY 2001, continue R&D activities initiated in FY 2000 associated with managing long term effects of plant aging.

In FY 2001, issue an annual update to the Joint DOE/EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants.

Nuclear Energy Research Initiative (ER-2)

In FY 1999, established a peer-reviewed Nuclear Energy Research Initiative (NERI), initially funded at $19 million, to select and conduct investigator-initiated innovative scientific and engineering research that will address the issues facing the future of nuclear power in the U.S., including proliferation concerns, economics, and the management of nuclear waste.

In FY 2000, continue NERI research to improve the understanding of new reactor and fuel cycle concepts, and nuclear waste management technologies and begin to develop a preliminary feasibility assessment of the concepts and technologies.

In FY 2000, advance the state of scientific knowledge and technology to enable incorporation of improved proliferation resistance, safety and economics in the potential future design and development of advanced reactor and nuclear fuel systems.

In FY 2001, complete the first 3-year phase of NERI research and development by identifying feasible and important reactor and fuel cycle concepts for continued development.

In FY 2001, establish the International Clean Energy Initiative/International Nuclear Energy Research Initiative to promote bilateral research to improve the cost, and enhance the safety, nonproliferation and waste of future nuclear energy systems.

Civilian Research and Development (ATW) (EQ-6)

Completed the Accelerator Transmutation of Waste (ATW) Roadmap report and provided to Congress on November 1, 1999. (Office of Civilian Radioactive Waste Management (RW) responsibility.)

In FY 2000, establish a science and engineering based research program into ATW technology development.

In FY 2000, commence systems studies to establish and evaluate technology options and narrow the choices.

In FY 2000, Issue a Program Plan for the conduct and management of the ATW research program.

In FY 2001, complete the evaluation of the trade studies and experimental data on the lead-bismuth loop, including test data on the performance of the Russian lead-bismuth target, generate a detailed program plan with recommendations. This plan will be reviewed by NERAC and provided to OMB, OSTP, and Congress.

Termination Costs (SC-4 & EQ-6)

Complete the demonstration of the electrometallurgical spent fuel treatment technology by the end of FY 1999 using Experimental Breeder Reactor-II spent nuclear fuel.

Depending upon the conclusion of the NEPA analysis currently underway, complete Fuel Conditioning Facility maintenance and resume sodium-bonded fuel treatment activities by the end of FY 2000 and treat 0.6 MTHM of EBR-II spent nuclear fuel in FY 2001.

By FY 2002, install the necessary equipment to make the Fuel Conditioning Facility and the Hot Fuel Examination Facility (HFEF) at ANL-West capable of full capacity fuel treatment (5 MTHM/year).

Complete production waste equipment process qualification and start waste form production for geologic disposal by the end of FY 2002.

Initiate draining sodium from EBR-II primary system and processing it for disposal in FY 2000.

Complete the conversion and disposition of 100 percent of the secondary sodium coolant from the Experimental Breeder Reactor-II and 40 percent of the Fermi reactor sodium coolant in storage at Argonne National Laboratory-West by the end of FY 2000.

By the end of FY 2001, complete draining the EBR-II primary system and process 100 percent of all EBR-II sodium in compliance with the Idaho National Engineering and Environmental Laboratory Site Treatment Plan.

Complete the conversion and disposition of 100 percent of the Fermi reactor sodium coolant in storage at Argonne National Laboratory-West by the end of FY 2001.

Following completion of primary sodium drain, initiate residual sodium reaction to permit final deactivation of EBR-II and all directly related facilities by March 2002.

In FY 2001, implement the DOE Lead Laboratory charter and develop comprehensive proposals for research and development projects that contribute to the effort to develop new nuclear energy technologies.

Fast Flux Test Facility (FFTF) (EQ-6)

In FY 1999, maintain the FFTF in a safe, environmentally-compliant standby condition.

In FY 2000, maintain the FFTF in a safe, environmentally-compliant standby condition while implementing a Secretarial decision to conduct a National Environmental Policy Act review of the environmental impacts of returning the facility to operation.

In FY 2001, complete the National Environmental Policy Act review of the environmental impacts of returning the facility to operation and issue a Record of Decision.

If the December 2000 Record of Decision leads to the initiation of a FFTF restart project, initiate conceptual design activities for system restoration and required upgrades.

If the December 2000 Record of Decision leads to the permanent shutdown of the FFTF, complete the procurement of additional interim spent fuel storage casks and drain the sodium coolant from the reactor vessel and primary heat transport system.

Isotope Production and Distribution (SC-2 & SC-4)

In FY 1999, initiate construction and commissioning of the Los Alamos Isotope Production Facility, improving isotope quality with greater operating efficiency.

In FY 1999, all major capital investments at the Hot Cell Facility and scheduled modifications of the Annular Core Research Reactor for emergency production of molybdenum-99 have been completed. In March 1999, a request for Technical/Business Strategy Concepts for producing and distributing was issued. After a detailed evaluation, it was determined that no private firm met the qualifications, hence no award was made.

By the end of FY 2000, complete at least 40 percent of the construction of the Los Alamos Isotope Production Facility, which is needed for the production of short-lived isotopes for medical research.

By the end of FY 2001, complete 90 percent of the construction of the Los Alamos Isotope Production Facility, which is needed for the production of short-lived isotopes for medical research.

In FY 2000, implement the Advanced Nuclear Medicine Initiative by providing isotopes or financial assistance for at least five to ten researchers.

In FY 2001, continue implementation of the Advanced Nuclear Medicine Initiative by providing isotopes or financial assistance for at least 7 to 10 researchers.

Supply quality stable and radioactive isotopes for industrial, research, and medical applications that continue to meet customer specifications and maintain 95 percent on-time deliveries.

In FY 2000 and FY 2001, invest in two new process development technologies each year, as requested by researchers, that enhance isotope production, services, and delivery application systems.

Uranium Programs (EQ-5)

In FY 2001, initiate procurement to convert the Department's DUF_6 inventories.

Meet legal obligations to the Ohio Environmental Protection Agency and the Tennessee Department of Environment and Conservation, and commitments to the Defense Nuclear Facilities Safety Board to ensure the safety of the Department's inventory of UF_6.

William D. Magwood, IV **Date**
Director, Office of Nuclear Energy, Science and Technology

Nuclear Energy Research & Development

Program Mission

The mission of the Nuclear Energy Research and Development program is to conduct advanced research and development in areas such as nuclear power and space power systems. In addition, this program supports nuclear engineering education and the enhancement of the Nation's nuclear science infrastructure.

The Department believes that preserving the national nuclear technical capability over the long term will require the establishment of clear "lead laboratory" roles covering specific nuclear science and technology topics to each of our national laboratories. For example, the Department's nuclear energy research and development program will work closely with the Nuclear Reactor Technology Lead Laboratories -- Idaho National Engineering and Environmental Laboratory (INEEL) and Argonne National Laboratory (ANL) -- to maintain and apply well-qualified technical capabilities to assure the Department is maximizing its investment in nuclear reactor technology research and development. Applying these capabilities will also better equip the Department to: (a) explore and evaluate potential future technology activities; (b) evaluate the facility requirements to support the Department's reactor technology research agenda; and (c) understand and track nuclear reactor technology developments in other programs and other countries, as well as serve as a long-term repository to maintain and apply the results of nuclear reactor research worldwide.

The Department obtains advice on the direction of the nuclear technology R&D program from the Nuclear Energy Research Advisory Committee (NERAC). NERAC is a formal federal advisory committee which provides expert, independent advice on long-range plans, priorities, and strategies of the Office of Nuclear Energy, Science and Technology (NE). The NERAC has formed a Subcommittee on Long Range Planning for Nuclear Energy Research, which has been charged to identify the role and areas of nuclear energy research for NE. This activity is focused on four key questions: 1) What should the long term role of the Department be in conducting nuclear energy R&D? 2) What should the mix in the NE programs be between long term, high risk projects and the intermediate term research? 3) What are the key areas of science and technology on which the nuclear energy programs should be focused over the next decade? 4) What should the role of industry be in funding these programs? The initial report of the subcommittee was presented to NERAC in July 1999. The complete report will be issued by NERAC during FY 2000, and serve to help the Department set the future course of its nuclear technology R&D.

The Nuclear Energy Research and Development program supports the latest draft of the DOE Strategic Plan and the FY 2001 Performance Plan as follows:

Energy Resources Objective 2 - Promote reliable, affordable electricity supplies that are generated with acceptable environmental impacts.

- FY 2001 Strategy - Nuclear Energy Plant Optimization (NEPO)

The Department will continue to conduct government-industry cost-shared, research and development to address the issues associated with long-term operation of existing nuclear power plants and to apply new technology to improve plant reliability, availability, and productivity. The program will be conducted on a 50-50 cost-shared basis with industry consistent with the updated Joint DOE-Electric Power Research Institute Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants to be updated in FY 2000. The projects for NEPO will be conducted at national laboratories, industrial organizations, and universities. The Department and NRC coordinate program planning to assure that their research and development activities are complimentary, cost-effective, and without duplication. The Subcommittees on Operating Nuclear Power Plant Research, Coordination, and Planning, and on Long Range Planning for Nuclear Energy Research of NERAC provide the Department advice on the conduct of the NEPO research and development program including criteria for prioritizing the research. A Coordinating Committee with representatives from utilities, national laboratories, universities, and NRC has been established. This coordinating committee works directly with the NERAC Subcommittee on Operating Nuclear Power Plant Research, Coordination, and Planning and prioritizes the R&D tasks and guides the update of the Joint DOE-EPRI Strategic R&D Plan. To assure that DOE remains fully coordinated with the Nuclear Regulatory Commission in all aspects of their research programs, the Department signed a memoranda of understanding (MOU) for cooperative R&D with the Commission on August 16, 1999.

- FY 2001 Strategy - Nuclear Energy Research Initiative (NERI)

The Department will conduct investigator-initiated, peer-reviewed research and development at universities, national laboratories, and industrial organizations to advance the scientific knowledge base and develop new technologies that will, as recommended by the President's Committee of Advisors on Science and Technology (PCAST) Panel on Federal Energy Research and Development, address the principal obstacles to the expanded use of nuclear energy, advance the state of nuclear technology for a competitive marketplace, and help maintain a nuclear science and technology infrastructure to meet future technical challenges. The Subcommittee on Long Range Planning for Nuclear Energy Research of NERAC will provide the Department advice on the NERI research and development program.

In FY 2001, the Department will continue the research projects awarded in FY 1999 and FY 2000 and award new research projects. In addition, the Department will initiate bilateral research cooperation with other nations through the International Clean Energy Initiative/International Nuclear Energy Research Initiative (I-NERI), which would be focused on advanced technologies to improve the cost and enhance safety, proliferation resistance and waste management of advanced nuclear energy systems.

*Science Objective 4* - Provide the extraordinary tools, scientific workforce, and infrastructure that assure our Nation's leadership in the physical, biological, and computational sciences and in multidisciplinary research.

- FY 2001 Strategy - Advanced Radioisotope Power Systems

The Department will develop, demonstrate, test, and deliver advanced nuclear power systems for space and national security missions.

- FY 2001 Strategy - University Reactor Fuel Assistance and Support

The Department will support and promote university, college, and preparatory technology programs that deliver information and contribute to learning in nuclear science and engineering education, enable advanced educational research opportunities, build capabilities at educational institutions, and improve educational opportunities for diverse groups.

- FY 2001 Strategy - Test Reactor Area Landlord (TRA)

The Department will identify, fund, and perform Test Reactor Area site maintenance, construction upgrade projects, and environmental compliance activities in accordance with DOE, Federal, and State requirements.

Environmental Quality Objective 6 - Improve scientific understanding and develop and deploy innovative technologies that reduce cost; are more protective of workers, the public, and the environment; and resolve currently intractable problems.

- FY 2001 Strategy - Civilian Research and Development (ATW)

Once the Department has evaluated the trade studies, and experimental data on the lead-bismuth loop, including test data on the performance of the Russian lead-bismuth target, a detailed program plan with recommendations will be generated. This plan will be reviewed by NERAC and provided to OMB, OSTP, and Congress. Until such time the Department will defer funding of the science and engineering based research on the ATW program.

Program Goals

Advanced Radioisotope Power Systems (SC-4)

Provide compact, safe, reliable nuclear power systems and related technologies to space, national security and other customers.

University Reactor Fuel Assistance and Support (SC-4)

Support improved U.S. nuclear engineering education and research infrastructure.

TRA Landlord (SC-4)

Manage DOE nuclear facilities in a safe, environmentally-sound, and cost effective manner and provide for the easy, cost-efficient use of relevant facilities by non-Federal researchers.

Nuclear Energy Plant Optimization (ER-2)

The cooperative, cost-shared, R&D program will be conducted with industry to address the complex technical issues associated with managing the long-term degradation effects of plant aging while improving plant reliability and efficiency.

Nuclear Energy Research Initiative (ER-2)

Sponsor investigator-initiated, peer-reviewed R&D on new technologies that will address the principal obstacles to the future use of nuclear energy, advance the state of nuclear technology for a competitive marketplace, and help maintain a nuclear science and technology research infrastructure to meet future technical challenges.

Civilian Research and Development (ATW) (EQ-6)

Conduct a cooperative science based ATW research and development program to address the key technology issues associated with the development and deployment of an optimized ATW system, with international collaboration and including attention to global issues of nonproliferation, ecology, energy, and economics.

Program Objectives

Advanced Radioisotope Power Systems (SC-4)

Maintain and enhance the U.S. capability to build advanced power supplies for ongoing and future national security applications and NASA space exploration missions. *(Program Objective 1)*

University Reactor Fuel Assistance and Support (SC-4)

Provide fuel assistance, fellowship grants, reactor upgrade funding, and other assistance to students and U.S. universities, in cooperation with industry. *(Program Objective 1)*

TRA Landlord (SC-4)

Ensure that TRA common use facilities and the utility infrastructure are maintained and operated to meet the requirements of tenant programs and in accordance with Federal and state environment, safety and health laws and regulations. *(Program Objective 1)*

Nuclear Energy Plant Optimization (ER-2)

Implement selected activities from the DOE/EPRI Joint Strategic R&D Plan in cooperation with the utility industry, universities, national laboratories, and the Nuclear Regulatory Commission to develop advanced technologies and methodologies that will enhance nuclear generation reliability, availability, and productivity. *(Program Objective 1)*

Nuclear Energy Research Initiative (ER-2)

Develop new reactor and fuel cycle concepts, and scientific and technology breakthroughs in nuclear energy which enhance the performance, efficiency, reliability, proliferation-resistance, and economics of nuclear power. *(Program Objective 1)*

Advance U.S. nuclear technology to maintain the Nation's international leadership in nuclear issues and a competitive position in overseas markets and future domestic markets. *(Program Objective 2)*

Promote and maintain a nuclear science and technology research infrastructure to meet future challenges. *(Program Objective 3)*

Collaborate with International agencies and research organizations to address nuclear technology development on a leveraged cost-shared quid pro quo basis. *(Program Objective 4)*

Promote U.S. leadership and partnership in bilateral research opportunities. *(Program Objective 5)*

Civilian Research and Development (ATW) (EQ-6)

Conduct systems studies to identify the most promising ATW technology options, from which technology choices could be compared and reference options confirmed or changed based on the outcome of the studies. Studies may include analysis of major institutional issues relevant to ATW implementation and overall system optimization. *(Program Objective 1)*

Conduct trade studies and plan research to develop and demonstrate an optimum transmutation method for the ATW system, including spallation target, ATW fuel and blanket forms, coolant, and heat removal systems. *(Program Objective 2)*

Identify, investigate and plan demonstration of optimum technologies for the treatment of commercial spent nuclear fuel, ATW fuel and waste forms in a manner that maintains proliferation resistance and waste minimization. *(Program Objective 3)*

Plan, develop, test and demonstrate components and assemblies for an accelerator system optimized for meeting the ATW mission. *(Program Objective 4)*

Performance Measures

Advanced Radioisotope Power Systems (SC-4)

In FY 2000, execute industrial contract and initiate associated laboratory efforts to develop small Radioisotope Thermoelectric Generators (RTGs) for anticipated use on NASA's Europa Orbiter and Pluto/Kuiper missions planned for launch in 2003 and 2004. *(Performance Measure supports Program Objective 1)*

In FY 2000, complete bench scale demonstration of the process to recover Pu-238 scrap for reuse in power systems for future missions using radioisotope power systems. *(Performance Measure supports Program Objective 1)*

In FY 2001, bring Pu-238 scrap recovery line to full operation and process two kilograms of Pu-238 scrap for reuse in ongoing missions requiring the use of radioisotope power systems. (*Performance Measure supports Program Objective 1*)

In FY 2001, complete final design and initiate fabrication of small Radioisotope Thermoelectric Generators (RTGs) for anticipated use on NASA's Europa Orbiter and Pluto/Kuiper missions planned for launch in 2003 and 2004. *(Performance Measure supports Program Objective 1)*

University Reactor Fuel Assistance and Support (SC-4)

Support U.S. universities' nuclear energy research and education capabilities by: *(Performance Measure supports Program Objective 1)*
  - < Providing fresh fuel to all university reactors requiring this service.
  - < Funding universities with research reactors for reactor upgrades and improvements (21 reactors in FY 1999; and approximately 23 reactors each year in FY 2000 and FY 2001).
  - < Partnering with private companies to fund DOE/Industry Matching Grants Program for universities (21 in FY 1999; and 17 or more each year in FY 2000 and FY 2001).
  - < Increasing the funding for Reactor Sharing in FY 1999 by 40 percent over FY 1998, and in FY 2000 and FY 2001 continue support, enabling each of the 29 schools eligible for the program to improve the use of their reactors for teaching, training, and education within the surrounding community.

Attract outstanding U.S. students to pursue nuclear engineering degrees by: *(Performance Measure supports Program Objective 1)*
  - < Providing fellowships (22 in FY 1999 and 22-24 each year in FY 2000 and FY 2001).
  - < Increasing the number of Nuclear Engineering Education Research Grants (in FY 1999 existing and new grants will total 39; and in FY 2000 and FY 2001 existing and new grants will total approximately 45).
  - < Providing Scholarships and summer on-the-job training to sophomore, junior and senior nuclear engineering and science scholarship recipients (29 junior/senior and 38 sophomore for a total of 67 in FY 1999; and approximately 50 each year in FY 2000 and FY 2001) .

Test Reactor Area Landlord (SC-4)

Continue to upgrade the physical plant and site infrastructure in accordance with the long range plan to ensure safe and reliable operation of Test Reactor Area site facilities. *(Performance Measure supports Program Objective 1)*

Nuclear Energy Plant Optimization (ER-2)

In FY 1999, completed Memoranda of Understanding with the Nuclear Regulatory Commission (NRC) and the Electric Power Research Institute (EPRI) to guide future implementation of the Joint DOE-EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants. *(Performance Measure supports Program Objective 1)*

In FY 2000, implement a cooperative cost-shared R&D program by working with industry, universities, national laboratories, and the Nuclear Regulatory Commission, to address technical issues that could prevent continued operation of current nuclear power plants. *(Performance Measure supports Program Objective 1)*

In FY 2000, issue the first update to the Joint DOE/EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants. *(Performance Measure supports Program Objective 1)*

In FY 2001, continue R&D activities initiated in FY 2000 associated with managing long term effects of plant aging. *(Performance Measure supports Program Objective 1)*

In FY 2001, issue an annual update to the Joint DOE/EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants. *(Performance Measure supports Program Objective 1).*

Nuclear Energy Research Initiative (ER-2)

In FY 1999, established a peer-reviewed Nuclear Energy Research Initiative (NERI), initially funded at $19 million, to select and conduct investigator-initiated innovative scientific and engineering research that will address the issues facing the future of nuclear power in the U.S., including proliferation concerns, economics, and the management of nuclear waste. *(Performance Measure supports Program Objectives 1, 2, and 3)*

In FY 2000, continue NERI research to improve the understanding of new reactor and fuel cycle concepts, and nuclear waste management technologies and begin to develop a preliminary feasibility assessment of the concepts and technologies. *(Performance Measure supports Program Objective 1, 2 and 3)*

In FY 2000, advance the state of scientific knowledge and technology to enable incorporation of improved proliferation resistance, safety and economics in the potential future design and development of advanced reactor and nuclear fuel systems. *(Performance Measure supports Program Objective 1, 2, and 3)*

In FY 2001, complete the first 3-year phase of NERI research and development by identifying feasible and important reactor and fuel cycle concepts for continued development. *(Performance Measure supports Program Objectives 1, 2, and 3)*

In FY 2001, establish the International Clean Energy Initiative/International Nuclear Energy Research Initiative to promote bilateral research to improve the cost, and enhance the safety, nonproliferation and waste of future nuclear energy systems. *(Performance Measure supports Program Objectives 4 and 5)*

Civilian Research and Development (ATW) (EQ-6)

Completed the Accelerator Transmutation of Waste (ATW) Roadmap report and provided to Congress on November 1, 1999. (Office of Civilian Radioactive Waste Management (RW) responsibility.)

In FY 2000, establish a science and engineering based research program into ATW technology development. *(Performance Measure supports Program Objectives 1, 2, 3 and 4)*

In FY 2000, commence systems studies to establish and evaluate technology options and narrow the choices. *(Performance Measure supports Program Objectives 1, 2, 3 and 4)*

In FY 2000, Issue a Program Plan for the conduct and management of the ATW research program. *(Performance Measure supports Program Objectives 1, 2, 3 and 4)*

In FY 2001, complete the evaluation of the trade studies and experimental data on the lead-bismuth loop, including test data on the performance of the Russian lead-bismuth target, generate a detailed program plan with recommendations. This plan will be reviewed by NERAC and provided to OMB, OSTP, and Congress. *(Performance Measure supports Program Objectives 1, 2, 3 and 4)*

Significant Accomplishments And Program Shifts

Advanced Radioisotope Power Systems (SC-4)

Startup the capability to recover plutonium-238 scrap and recover two kilograms of scrap plutonium-238 for reuse for ongoing and future missions.

University Reactor Fuel Assistance and Support (SC-4)

- # Awarded 22 fellowships in FY 1999, with 22-24 expected in both FY 2000 and FY 2001 to outstanding and promising M.S. and Ph.D. students engaged in nuclear science research and training to ensure an adequate supply of trained nuclear personnel.

- # Funded 39 Nuclear Engineering Education Research grants in FY 1999 with 45 expected in FY 2000 and FY 2001 to competitively selected universities which promote innovative research in nuclear engineering technologies.

- # Continue to fund 3 radiochemistry grants in FY 1999 to provide faculty support and student fellowships to educate a new generation of radiochemists with no additional awards expected in FY 2000 or FY 2001.

TRA Landlord (SC-4)

- # Complete the architectural and engineering phase of the TRA Fire and Life Safety Upgrade construction project.

- # Complete Title II design and begin the construction phase of the TRA Electrical Utility Upgrade construction project.

Nuclear Energy Plant Optimization (ER-2)

- # In FY 1999, completed Memoranda of Understanding with the Nuclear Regulatory Commission and the Electric Power Research Institute (EPRI) to guide future implementation of the Joint DOE-EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants.

- # In FY 2000, update the DOE - Electric Power Research Institute (EPRI) Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants consistent with the recommendations of the President's Committee of Advisors on Science and Technology (PCAST) Panel on Federal Energy Research and Development and the NERAC Subcommittee on Operating Nuclear Power Plants Research, Coordination, and Planning.

- # In FY 2000, implement the DOE - EPRI Strategic Plan working with national laboratories, the Nuclear Regulatory Commission, universities and industry conducting a cooperative R&D program guided by an industry/government coordinating committee and NERAC.

- # In FY 2001, continue cooperative research and development activities initiated in FY 2000, consistent with the updated Joint Strategic Plan under the guidance of the coordinating committee and NERAC.

- # In FY 2001 issue an annual update to the Joint Strategic Plan.

Nuclear Energy Research Initiative (ER-2)

In FY 1999, the investigator proposed, peer-reviewed Nuclear Energy Research Initiative was initiated with the selection and award of 46 research and development grants and cooperative agreements.

In FY 2000, continue the multi-year advanced reactor, fuel cycle, nuclear waste and fundamental nuclear science R&D projects awarded in FY 1999. Issue the second phase of grants and cooperative agreements to address nuclear energy economics, nuclear waste and proliferation concerns.

In FY 2001, continue the multi-year advanced reactor, fuel cycle, nuclear waste and fundamental nuclear science R&D projects awarded in FY 1999 and FY 2000, and issue the third phase of grants and cooperative agreements to address nuclear energy economics, nuclear waste and proliferation concerns.

At the end of FY 2001, complete the first multi-year (FY 1999) phase of NERI research and development by identifying important proliferation resistant reactor and fuel cycle concepts, advanced reactor designs with higher efficiencies and low power output, advanced nuclear fuel technologies and new nuclear waste science and technology concepts for further development.

In FY 2001, initiate the International Clean Energy Initiative/International Nuclear Energy Research Initiative to promote collaborative, cost-shared research with foreign organizations focused on advanced technologies for improving the cost, safety, waste management and proliferation resistance of advanced nuclear energy systems.

Civilian Research and Development (ATW) (EQ-6)

In FY 1999, completed the ATW roadmap directed by Congress in the FY 1999 Energy and Water Appropriation Act--submitted to Congress on November 1, 1999. (Office of Civilian Radioactive Waste Management (RW) responsibility.)

In FY 2000, establish and seek guidance from an ATW Subcommittee under the Nuclear Energy Research Advisory Committee on the ATW program.

In FY 2000, develop a six-year ATW program plan including a "Decision Framework" under which technology choices are examined and systematically evaluated.

In FY 2001, complete the evaluation of the trade studies and experimental data on the lead-bismuth loop, including test data on the performance of the Russian lead-bismuth target, generate a detailed program plan with recommendations. This plan will be reviewed by NERAC and provided to OMB, OSTP, and Congress. Until such time the Department will defer funding of the science and engineering based research on the ATW program.

Funding Profile

(dollars in thousands)

	FY 1999 Current Appropriation	FY 2000 Original Appropriation	FY 2000 Adjustments	FY 2000 Current Appropriation	FY 2001 Request
Nuclear Energy R&D					
Advanced Radioisotope Power Systems	36,841 [a]	34,500	-359 [b]	34,141	31,200
University Reactor Fuel Assistance and Support	11,000	12,000	0	12,000	12,000
Test Reactor Area Landlord	6,766	9,000	-97 [b]	8,903	9,000
Nuclear Energy Plant Optimization	0	5,000	-24 [c]	4,976	5,000
Nuclear Energy Research Initiative	18,496 [a]	22,500	-108 [c]	22,392	35,000
Civilian Research and Development (ATW)	0 [a]	9,000	-44 [c]	8,956	0
Total, Nuclear Energy R&D	73,103 [a]	92,000	-632	91,368	92,200

[a] Excludes funds transferred to the SBIR/STTR program.

[b] Includes contractor travel savings, and general reduction distributed to this program.

[c] Includes the general reduction distributed to this program.

Funding by Site

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Albuquerque Operations Office					
Albuquerque Operations Office	10	10	10	0	0.0%
Los Alamos National Laboratory	9,750	15,884	10,660	-5,224	-32.9%
Sandia National Laboratories	2,357	2,022	1,654	-368	-18.2%
Total, Albuquerque Operations Office	12,117	17,916	12,324	-5,592	-31.2%
Chicago Operations Office					
Chicago Operations Office	2,149	6,357	6,512	155	2.4%
Argonne National Laboratory	2,336	4,496	2,332	-2,164	-48.1%
Brookhaven National Laboratory	200	400	270	-130	-32.5%
Total, Chicago Operations Office	4,685	11,253	9,114	-2,139	-19.0%
Idaho Operations Office					
Idaho Operations Office	100	75	75	0	0.0%
Idaho National Engineering and Environmental Laboratory	15,490	18,661	18,788	127	0.7%
Total, Idaho Operations Office	15,590	18,736	18,863	127	0.7%
Oakland Operations Office					
Oakland Operations Office	8,555	5,688	2,588	-3,100	-54.5%
Lawrence Livermore National Laboratory	120	150	155	5	3.3%
Total, Oakland Operations Office	8,675	5,838	2,743	-3,095	-53.0%
Ohio Operations Office					
Ohio Operations Office	0	0	0	0	0.0%
Mound Plant	7,725	8,300	6,100	-2,200	-26.5%
Total, Ohio Operations Office	7,725	8,300	6,100	-2,200	-26.5%
Oak Ridge Operations Office					
Oak Ridge National Laboratory	6,771	6,475	6,726	251	3.9%
Oak Ridge Institute of Science and Education	1,075	825	825	0	0.0%
Total, Oak Ridge Operations Office	7,846	7,300	7,551	251	3.4%
Richland Operations Office					
Fluor Daniel Hanford	129	0	0	0	0.0%
Pacific Northwest National Laboratory	1,241	1,492	1,443	-49	-3.3%
Total, Richland Operations Office	1,370	1,492	1,443	-49	-3.3%
Savannah River Site	1,194	1,100	1,100	0	0.0%
Washington Headquarters	4,560	4,267	4,416	149	3.5%
All Other Sites	9,341	15,166	28,546	13,380	88.2%
Total, Nuclear Energy R&D	73,103 [a]	91,368 [b]	92,200	832	0.9%

[a] Excludes funds transferred to the SBIR/STTR program.

[b] Includes the contractor travel savings and general reduction distributed to these programs.

Site Descriptions

Los Alamos National Laboratory

Los Alamos National Laboratory (LANL) is a U.S. Department of Energy scientific research laboratory located in New Mexico. A portion of the Plutonium Facility-4 at the Technical Area-55 at LANL is dedicated to plutonium-238 (Pu-238) processing. This capability is the only existing Pu-238 processing capability within the DOE complex and is used to process and encapsulate Pu-238 used in radioisotope power sources for the National Aeronautics Space Administration (NASA) space exploration missions and national security applications. LANL is the lead organization for one NERI award and a collaborating organization on another NERI proposal to develop new reactor concepts with improved performance and higher efficiency. LANL will serve as the lead laboratory for the Civilian Research and Development (ATW) program. LANL was the lead laboratory for the Accelerator Production of Tritium (APT) program and has the highest level of high energy linear accelerator expertise in the country. The Los Alamos Neutron Science Center (LANSCE) contains an 800 MeV linear proton accelerator and the Low Energy Demonstration Accelerator (LEDA), which will be used in the Civilian R&D program to develop and demonstrate the ATW accelerator technology.

Sandia National Laboratories

Sandia National Laboratories (SNL) is a U.S. Department of Energy scientific research laboratory located in New Mexico. SNL has unique analytical and testing capability used to evaluate radioisotope power system response during hypothetical launch accidents. These capabilities are used to support preparation of Safety Analysis Reports. SNL is the lead organization for five NERI awards and the collaborating organization on three other awards involving proliferation resistant reactor design, improved reactor performance and nuclear waste management.

Argonne National Laboratory

Argonne National Laboratory (ANL) is one of the U.S. Department of Energy's largest research centers, and was the nation's first national laboratory, chartered in 1946. ANL is located at two sites. The Illinois site, ANL-East, is the main laboratory and occupies 1500 acres, surrounded by a forest preserve about 25 miles southwest of the Chicago Loop. The Idaho site, ANL-West, is located within the boundary of the Idaho National Engineering and Environmental Laboratory (INEEL) in Southeastern Idaho, about 35 miles west of Idaho Falls.

In July 1999, the Department selected the ANL, along with the INEEL, to serve as the Nuclear Reactor Technology Lead Laboratories. These Lead Laboratories will assist and work with the Department's Office of Nuclear Energy, Science and Technology to maintain and apply world class technical capabilities to assure that the Department is maximizing its investment in nuclear reactor technology research and development. This effort will focus principally on research and development activities that addresses long-term nuclear reactor technology issues such as reducing the cost of nuclear-generated electricity, finding better ways to deal with spent fuel and proliferation issues, improving the performance of existing plants, and achieving even higher levels of safety than has been achieved thus far.

ANL is supporting the NERI program as the lead organization for six awards and collaborating in five awards in the areas of proliferation resistant reactor and fuel technology, advanced nuclear fuels, waste management and fundamental nuclear sciences. ANL will provide the lead for development of ATW separations technology. ANL has an ongoing program in demonstration of the electrometallurgical treatment of spent nuclear fuel technology using the metal fuel form EBR-II at ANL-W.

Brookhaven National Laboratory

The Brookhaven National Laboratory (BNL) is a multiprogram laboratory located in Upton, New York. BNL research activities under the Nuclear Energy Research Initiative (NERI) are directed toward proliferation resistant fuel technology and new reactor design with improved safety performance. BNL is the lead organization on one award and is collaborating with a university on one other R&D award.

Idaho National Engineering and Environmental Laboratory

The Idaho National Engineering and Environmental Laboratory (INEEL) is an extensive research and engineering complex that has focused on some of the most advanced energy research in the world since 1949. In recent years, in addition to continued operation of complex nuclear and non-nuclear facilities, the INEEL has initiated technology development in applied environmental science and engineering. The Idaho Test Reactor Area (TRA) is located within the INEEL. Since the early 1950s, test reactors, laboratories, hot cells and supporting facilities have been built at TRA. The principal facility operating at TRA is the Advanced Test Reactor (ATR). The ATR is one of the world's largest and most advanced test reactors. It provides both vital irradiation testing for reactor fuels and core components and isotopes critically needed by medicine and industry. Other facilities currently operating on the site are: the ATR Critical Facility reactor, the TRA Hot Cells and the INEEL Applied Engineering and Development Laboratory. ATR operations and a wide variety of scientific research projects are planned to continue at TRA until well into the twenty-first century. The following facilities at TRA are shutdown in a surveillance and maintenance status awaiting decontamination and decommissioning: the Materials Test Reactor (MTR), the MTR Canal, the Engineering Test Reactor, the Coupled Fast Reactivity Measurement Facility, and the Advanced Reactivity Measurement Facility. TRA is operated for the Department by Bechtel BWTX Idaho, LLC. Responsibility for TRA Landlord resides with the Office of Nuclear Energy, Science and Technology. The TRA Landlord account provides for maintaining and upgrading TRA common use facilities and the utility infrastructure to ensure that programmatic, reliability and ES&H requirements are met.

INEEL manages the University Reactor Fuel Assistance Program to provide fuel for university test, research, and training reactors, the shipping of spent fuel from university reactors to Savannah River, and conversion of university reactors from high enriched uranium (HEU) to low enriched uranium (LEU). INEEL also manages the Nuclear Engineering Education Research (NEER) program that provides research grants to nuclear engineering schools and the University Reactor Upgrade program that provides funding for improvements and maintenance at the 29 university research reactors. INEEL provides management, quality assurance, procurement, and technical assessment and review associated with the manufacturing, shipment, and receipt inspection assessment and evaluations of replacement fuel and the conversion of HEU fuel to LEU fuel for university reactors, and the shipping of spent fuel from these reactors.

INEEL is participating in the NERI program as the lead organization on three awards and collaborating on two other awards; INEEL research is in areas of low output reactor technology and advanced proliferation resistant fuel technology.

In July 1999, the Department selected INEEL, along with ANL, to serve as the Nuclear Reactor Technology Lead Laboratories. These Lead Laboratories will assist and work with the Department's Office of Nuclear Energy, Science and Technology to maintain and apply world class technical capabilities to assure that the Department is maximizing its investment in nuclear reactor technology research and development. This effort will focus principally on research and development activities that addresses long-term nuclear reactor technology issues such as reducing the cost of nuclear-generated electricity, finding better ways to deal with spent fuel and proliferation issues, improving the performance of existing plants, and achieving even higher levels of safety than has been achieved thus far.

Lawrence Livermore National Laboratory

Lawrence Livermore National Laboratory (LLNL) is a U.S. Department of Energy scientific research laboratory located in California. In support of the Nuclear Energy Research Initiative (NERI), LLNL is collaborating with university, laboratory, and industry partners in two awards to conduct research on proliferation resistant reactor and fuel technology. LLNL is also supporting the NERAC Task Force on Technical Opportunities for increasing the proliferation resistance of global civilian nuclear power systems (TOPS).

Mound Plant

The Mound Plant is located in southwest Ohio with the city of Miamisburg. Previously, the main mission of the Mound Plant was to manufacture components for nuclear weapons for Defense Programs. As part of the Department's Non-nuclear Consolidation Plan, the Department decided to consolidate Defense Program activities to other sites and transferred the Mound site to the Office of Environmental Management for cleanup and transition of the facilities and properties to commercial operations. Only the facilities used to assemble and test radioisotope power systems used for NASA space exploration missions and national security applications would remain in use by DOE Programs. The program has recently conducted a study on whether to consolidate and maintain the radioisotope power system assembly and test capability as a stand-alone operation at the Mound site or transfer the operation to another Department site. It was decided that operations can be conducted safely at Mound, and it is not economically advantageous to move operations. On March 22, 1999, the Secretary of Energy announced that program operations would remain at Mound rather than be transferred to another site.

Oak Ridge National Laboratory

The Oak Ridge National Laboratory (ORNL) is a U.S. Department of Energy scientific research laboratory located in Oak Ridge, Tennessee. The ORNL has developed the unique capabilities for fabricating carbon insulator and iridium heat sources components for radioisotope power sources used for NASA space exploration missions and national security applications. These sophisticated heat source components are necessary for the safe operation of these power systems during normal operation and during launch, reentry or other deployment accidents.

ORNL is also participating in the NERI program as the lead research organization on four NERI awards involving advanced reactor and control concepts, reactor materials research and advanced fuel components.

Oak Ridge Institute for Science and Education

The Oak Ridge Institute for Science and Education (ORISE) is a Department of Energy science and education facility located in Oak Ridge, Tennessee. ORISE has developed unique capabilities and extensive experience in administering independent peer-review activities. ORISE supports the peer-review activities of the Nuclear Energy Research Initiative (NERI).

Pacific Northwest National Laboratory

The Pacific Northwest National Laboratory (PNNL) is a multiprogram laboratory located at the Department's Hanford site in Richland, Washington. PNNL is conducting research and development under the Nuclear Energy Research Initiative (NERI) as the lead organization on four NERI awards and collaborating in one other award involving advanced reactor and fuel technology, and fundamental nuclear science.

Savannah River Site

The Savannah River Site is located in the Central Savannah River Area of South Carolina. The Office of Nuclear Energy, Science and Technology is maintaining the Plutonium Fuel Form Facility in a safe environmentally shutdown mode until the facility is transferred to the Office of Environmental Management for decontamination and decommissioning.

All Other Sites

Funding supports commercial contracts involved in developing radioisotope power systems for national security missions and specialized safety analyses for the use of radioisotope power systems in space applications.

Includes funding for the Nuclear Energy Research Initiative, a new peer-reviewed competitive, investigator-initiated research and development program in FY 1999. The funding shown for all other sites in FY 1999 includes funding to be provided to universities and industry. The funding shown for FY 2000 and FY 2001 includes funding that will be provided to universities and industry as well as funding to be provided to laboratories as a result of solicitations and awards in future years.

Funding in FY 2000 for the Nuclear Energy Plant Optimization program is also shown in this category. Decisions regarding the specific 50-50 cost-shared, peer-reviewed research and development activities to be conducted and the performing organizations for FY 2001 will be made following the FY 2000 update of the Joint DOE-EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants. In formulating this program, the Department will utilize the advice of the Subcommittee on Operating Nuclear Power Plant Research, Coordination and Planning of the Nuclear Energy Research Advisory Committee.

Funding is also included for nuclear engineering fellowships and scholarships for outstanding graduate and undergraduate students which is awarded through a peer-reviewed, competitive process. The peer review committee is composed of nuclear engineering professors representing a broad spectrum of nuclear engineering programs throughout the U.S. The funding is then administered and awarded by the South Carolina University Research and Education Foundation for the Department of Energy. Both ORISE and Idaho Operations Office manage NE's HBCU program to assist minority students in receiving scholarships and fellowships.

Capital Operating Expenses & Construction Summary
Capital Operating Expenses

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Capital Equipment	1,727	800	1,300	500	62.5%
General Plant Projects	1,290	3,010	1,800	-1,210	-40.2%
Total, Capital Operating Expenses	3,017	3,810	3,100	-710	-18.6%

Construction Projects

(dollars in thousands)

	Total Estimated Cost (TEC)	Prior Year Approp-riations	FY 1999 Approp.	FY 2000 Approp.	FY 2001 Aprop.	Unapprop. Balance
95-E-20, TRA Fire and Life Safety Improvements, INEEL	15,446	9,021	2,425	1,500	500	2,000
99-E-200, TRA Electrical Utility Upgrade	6,995	0	341	1,333	925	4,445
Total, Construction		9,021	2,766	2,833	1,425	6,445

Advanced Radioisotope Power Systems

Mission Supporting Goals and Objectives

The Advanced Radioisotope Power Systems program supports the development, demonstration, fabrication, testing, and delivery of power systems required by the United States to support space exploration and special national security activities. Radioisotope power systems (RPS) are the enabling technology for space and national security applications requiring proven, reliable and maintenance-free power supplies capable of producing up to several kilowatts of power and operating under severe environmental conditions for many years. Previous NASA space exploration missions that have used radioisotope power systems include the Apollo lunar scientific packages and the Pioneer, Viking, Voyager, Galileo and Ulysses spacecrafts. More recent missions that used radioisotope power systems are the Mars Pathfinder mission launched in December 1996 and the Cassini mission to Saturn launched in October 1997. Without these power systems, many of the NASA missions to explore deep space and surfaces of planets and moons could not be performed.

Future NASA missions will continue to use radioisotope power systems. Projected missions include the Europa Orbiter, Pluto/Kuiper Express, and Solar Probe missions planned for launch in 2003, 2004, and 2007 respectively. A new national security mission is also underway which will require delivery of several RPSs over the next decade, and DOE will also provide radioisotope heater units (RHUs) for several NASA Mars Surveyor missions.

With NASA's current emphasis on smaller and less expensive spacecraft, future missions would benefit from an advanced power system that was more efficient, lighter weight, and used less radioisotope fuel. Efforts were initiated to meet this goal by developing an Advanced Radioisotope Power System (ARPS) that uses a new technology called Alkali-Metal Thermal to Electric Conversion (AMTEC). However, it became clear in late FY 1999 that this technology would not be ready for a 2003 launch. Therefore, the program reverted to developing small radioisotope thermoelectric generators (RTG) for the planned 2003 and 2004 launches. Efforts are continuing on developing the advanced technology for potential applications to later launches. In FY 2000 and FY 2001, design of the small RTG will be completed and fabrication of the four generators for the missions will be initiated. Efforts will also continue to support NASA's Environmental Impact Statement, to conduct safety testing and to prepare Safety Analysis Reports for the near-term NASA space missions.

As an expansion of ongoing national security applications, the Department is developing a new thermoelectric generator. This new generator will use a more efficient thermoelectric element and in FY 2001 the program will continue testing the thermoelectric element, proceed with design and initiate fabrication of an engineering unit of the new RTG, and continue development of the safety test data and safety analysis.

The Department is also supporting NASA in the potential use of Radioisotope Heater Units (RHUs) on planned Mars Surveyor missions. The near-term emphasis is on the first mission scheduled for 2001. In FY 2000, the Department's support for the environmental documentation for this mission will be completed. If the Record of Decision includes the use of RHUs, the Safety Analysis Report will be

completed in FY 2001; the RHUs will be shipped for installation on the spacecraft; and emergency preparedness planning and launch support activities will be provided for a launch scheduled in April 2001.

As the Department responds to these near-term planned missions, it must maximize the use of the existing finite inventory of Plutonium-238 (Pu-238) that is the basic building block of these systems. This will be accomplished by completing a new scrap recovery line at Los Alamos National Laboratory that will allow scrap or waste material or material that was used in test programs or did not initially meet specifications to be recycled and used again. In the longer term, a key issue facing the program is assuring that there is a long term supply of the Pu-238 isotope. Most of the current inventory of Pu-238 was produced in the reactors and processing facilities at Savannah River. However, the facilities used to produce the material are either shutdown or being phased out. A sufficient inventory of Pu-238 exists for the foreseeable national security missions. However, the currently planned space missions will exhaust the portion of the inventory set aside for these applications by the middle of this decade. Unless an assured supply is established, the ability to support future space missions will be lost. Therefore, the Department is considering establishing a domestic Pu-238 production capability to produce this non-weapons form of plutonium and is preparing a Programmatic Environmental Impact Statement (PEIS) that includes the issue of Pu-238 as part of the planning and decision process. The PEIS will also address the option to purchase Pu-238 from Russia under an existing contract set to expire in 2002. In order for this option to remain viable in the future, a new contract would have to be negotiated for purchases beyond 2002. In an effort to maintain the option for future domestic Pu-238 production, while awaiting the outcome of the environmental review, the Department is conducting a lab-scale technology demonstration and design activity to enable timely implementation of a positive decision to proceed.

In FY 2001, the Department will also continue a low-level effort on developing new, non-mission-specific technologies that could be used in power supplies that could cover a range of power levels required to support future NASA space missions. These technologies include advanced conversion concepts (Stirling), new materials, and new heat sources. Also, the program will continue to maintain the Plutonium Fuel Form (PuFF) Facility at the Savannah River site in an environmentally sound, safe shutdown condition until it is transferred to the Office of Environmental Management (EM) for decontamination and decommissioning.

The FY 2001 program also includes an assessment of special purpose fission technology, with an emphasis on potential space applications. As part of its nuclear R&D technology charter, the Department must assure that it has the technology base that could support the future application of fission technology in special purpose applications. There is a growing consensus that some future space applications will require fission technology and this assessment effort will identify the current technical status and related technology and facility needs should a development program be required to support space applications. This activity will be conducted as part of an interagency effort focused on assessing needs and requirements for special purpose fission systems for potential future applications.

The Department is charged with the development of nuclear technologies and systems by the Atomic Energy Act of 1954, as amended, and is authorized by the Act to possess special nuclear materials and operate nuclear facilities. To meet this charter, the Department has developed the program capabilities and facility infrastructure to produce and deliver radioisotope power systems. To maintain the long-term

viability for the program, and the space exploration and national security missions it enables, the Department must maintain these capabilities and the associated facility infrastructure as the sole national capability to produce radioisotope power systems.

The facility infrastructure for producing these power systems has been consolidated over the past few years to the three main operations described below. Without this infrastructure, radioisotope power systems cannot be produced, and without these power systems, critical national security activities and NASA missions to explore deep space and the surfaces of neighboring planets will not be possible. The facility infrastructure which must be sustained includes:

 # Iridium and Carbon Heat Source Component Fabrication Facilities at Oak Ridge National Laboratory

The Oak Ridge National Laboratory (ORNL) has developed the unique capability of fabricating carbon insulators and iridium cladding used to encapsulate and contain the plutonium-238 (Pu-238) fuel pellets. These sophisticated heat source components are necessary for the safe operation of the radioisotope heat source during normal operation and in the event of launch, reentry or other deployment accidents. The Department maintains its capabilities in this area through small scale production campaigns of these components for upcoming space missions and national security applications. Advanced fabrication processes are being developed to improve the performance and to reduce the cost of fabricating these components. The material properties of these components are characterized for input to mission safety analyses for the launch or deployment approval process. ORNL also performs materials testing and precious metal iridium inventory management for the Department's activities at other sites.

 # Plutonium-238 Processing and Encapsulation Facilities in the Technical Area-55 Complex at Los Alamos National Laboratory

The Department maintains a dedicated Pu-238 processing facility within the Plutonium Facility-4 at Technical Area-55 at the Los Alamos National Laboratory (LANL). This is the only facility in the United States that can perform these operations. LANL receives the Pu-238 oxide powder, performs incoming inspections, processes the powder through a complex set of operations to a pellet form, encapsulates the pellets in iridium cladding fabricated at ORNL, performs final inspection, and ships the encapsulated pellets to Mound (see following discussion) for assembly into heat sources. The Department maintains these operations through small-scale fabrication campaigns of encapsulated pellets for use in upcoming missions. LANL maintains the Pu-238 inventory for the Department. A Pu-238 scrap recovery line is being developed to recycle scrap for use on future programs. Startup activities should be initiated by the end of FY 2000 to bring the scrap recovery line to full operation in FY 2001. To minimize waste disposal costs, a new process is being developed to recover Pu-238 from process wastes and dispose of the remaining byproducts. LANL conducts safety and qualification tests on Pu-238 heat source components and also fuels and assembles radioisotope heater units used on NASA space missions.

An important element of maintaining the operational readiness of these facilities is the repair and upgrading of equipment. Over the past several years, LANL has been replacing equipment and glove boxes that have reached their useful lifetimes as a result of the Pu-238 processing campaign required for the Cassini mission. This glove box replacement program will continue in FY 2001.

 # Heat Source and Power System Assembly and Testing Facilities at the Mound Site

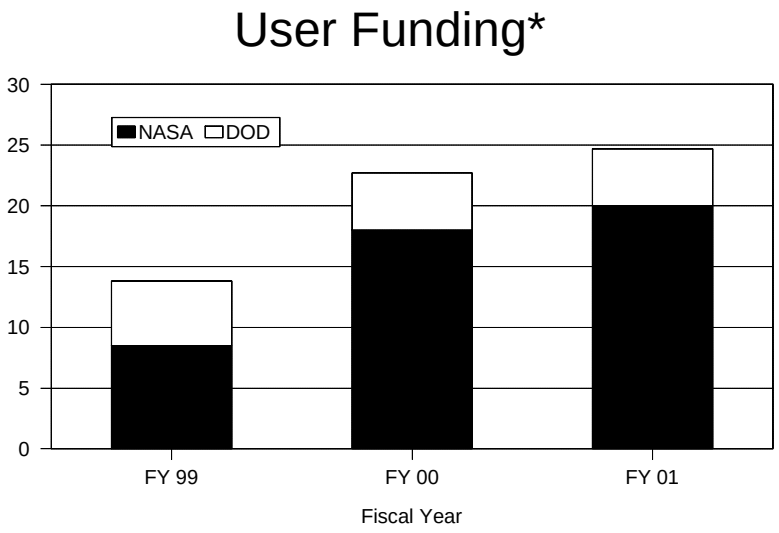
The Department maintains and operates facilities at the Mound site for heat source and power system assembly and testing. Consideration was given to transferring these operations to another site since the rest of the site is scheduled for cleanup and transfer to the private sector and the heat source and testing efforts would become a stand-along operation at Mound. A formal evaluation was undertaken that included initiating the preparation of an Environmental Impact Statement (EIS) and conducting analysis of the cost, safety and safeguards and security issues associated with moving or staying at Mound. As the evaluation proceeded, the Department determined that the operations can be conducted safely at Mound as a stand-alone operation and that, with consolidation of the efforts into fewer buildings, continuing the operations at Mound was the most economically advantageous option for the Department. Therefore, on March 22, 1999, the Secretary of Energy announced that program operations would remain at Mound rather than be transferred to another site. The EIS to consider other sites has been terminated and the consolidation efforts at Mound, including preparation of an Environmental Assessment, are proceeding. Beginning in FY 2001, this consolidation at Mound will result in infrastructure cost savings of nearly $2 million per year.

The consolidation effort primarily involves two buildings identified as Buildings 38 and 50. Heat source modules were assembled in Building 38 as iridium encapsulated Pu-238 pellets were received from LANL and carbon components were received from ORNL. The national security power systems were also assembled in Building 38. The assembly of the heat sources into the generators and the acceptance testing and related functions are carried out in Building 50. Building 50 is totally dedicated to the radioisotope power systems program. Since the power systems program used only a small part of Building 38, and this is an old building that is scheduled for demolition by the Office of Environmental Management (EM) as a part of the overall cleanup of the Mound site, the Department is consolidating the power systems efforts from Building 38 into Building 50. This consolidation will be completed in early FY 2000 to allow EM to proceed with their planned decontamination and decommissioning of Building 38. As part of the consolidation, new administrative and storage facilities are being constructed and support services such as electrical power, water, and heating are being severed from the rest of the site. These efforts will be completed by mid FY 2001.

As part of its overall support of the power systems program, Mound also stores and maintains a spare RTG used for the Cassini Mission in monitored storage. In addition, Mound is developing new fabrication processes, including performing weld development studies for the heat source for the RTGs for the new national security mission and developing plans for the assembly and testing of the small RTG the Department is developing for the Europa and Pluto missions. Mound also fabricates components for heater units which are fueled and assembled at LANL.

The Department recognizes the need to minimize the costs associated with maintaining the program facility infrastructure associated with this program. Efforts to streamline the program have been underway for several years and these efforts were summarized in a report that was submitted to Congress in response to guidance in the FY 1999 conference report. The overall funding level of the Advanced Radioisotope Power System program has been reduced from a peak level of $58.7 million in FY 1995 to a requested level of $31.2 million in FY 2001. These reductions reflect several actions that have been taken. For example, the Department worked with NASA to assure that they fund mission specific development and hardware fabrication, while the Department focuses on sustaining the unique program and facility infrastructure that is essential to be able to produce these power systems. Another area of reduction was the completion of several supporting efforts such as the design and fabrication of a new transport system for moving the radioisotope power systems.

The Department will continue efforts to minimize costs for the program. For example, the Department plans to request an independent review group to examine the radioisotope power system program to assess the cost efficiency of the Department's infrastructure. Also, discussions will continue with NASA and the national security users to ensure that they are funding the appropriate mission specific and hardware development costs. Currently, as shown below, NASA is projected to provide $23 million in FY 2001 and DOD will provide $4.7 million. The NASA costs are rising as the program moves into hardware fabrication for the 2003 and 2004 launches.



*The funds appropriated in Energy Supply are used to sustain the program and facility infrastructure that allows the Department to fulfill its charter to maintain radioisotope power system production capabilities for future space and national security missions. The user funding is provided to DOE by the sponsoring mission agencies for mission-specific development and hardware fabrication efforts. In FY 2001, NASA is expected to provide DOE with $20.0 million and DOD will provide $4.7 million.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Radioisotope Power Systems	29,840	26,222	22,440	-3,782	-14.4%
Special Applications	2,000	2,000	2,000	0	0.0%
Plutonium-238 Acquisition and Processing	5,001	5,760	4,600	-1,160	-20.1%
Special Purpose Fission Tech. Assessment	0	0	2,000	2,000	100.0%
SBIR	0	159	160	1	0.6%
Total, Advanced Radioisotope Power Systems	36,841 [a]	34,141 [b]	31,200	-2,941	-8.6%

Detailed Program Justification

(dollars in thousands)

	FY 1999	FY 2000	FY 2001
Radioisotope Power Systems			
# Maintain the program and facility operations and capabilities for current and future space and national security missions. Prepare facility operations for conduct of new NASA space missions and the new national security mission.			
< Maintain iridium and carbon heat source component operations at ORNL. In FY 2000, complete qualification runs for the improved iridium production process and in FY 2001, fabricate the first flight quality components using the new process.	3,455	3,500	3,500
< Maintain Pu-238 processing and encapsulation operations at LANL. In FY 2000 and FY 2001, continue repair and upgrade of Pu-238 gloveboxes and equipment. Also, in FY 2001, initiate encapsulation activities in support of heat sources for the small RTG being developed for NASA and for heat source testing of the improved RTG for the new national security mission.	5,925	6,300	6,500

[a] Excludes $159,000 which was transferred to the SBIR/STTR program.

[b] Includes the contractor travel savings and general reduction distributed to this program.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
< Maintain and operate Mound facilities and maintain shipping casks. In FY 2001, continue preparation of assembly and testing operations for NASA space missions and new national security mission, and fabricate heat source components for the safety test program for the new national security mission. Reduction from FY 1999 to FY 2000 level reflects consolidation into stand-alone operations. Decrease in FY 2001 assumes further efficiencies as stand-alone operations proceed.	7,400 [a]	5,900	5,500
< Perform safety model development and analyses, review safety analyses reports, conduct performance and safety testing of advanced concepts, prepare environmental documentation, perform safety analyses and prepare safety analyses reports for shipping casks, maintain and certify shipping casks and conduct special studies. The increase in funding reflects increased safety analyses and testing related to power system being developed for future missions.	2,560	3,100	3,230
< PuFF - Maintain PuFF facility in a safe shutdown mode.	730	800	800
< Investigate advanced converter, materials, and heat source technologies and concepts for potential applicability and use in future missions covering a wide range of power levels. The decrease in funding reflects completion of several technology efforts and deferral of other new and innovative concepts and ideas that could improve efficiency or enhance safety.	8,458	4,222	1,910
< General plant project (GPP) funding to build administrative and storage facilities at Mound as part of the Secretary's decision to consolidate ARPS program activities. The decrease in funding reflects completion of the GPP project.	0	1,900	200

[a] The Department had notified Congress that $400K of this funding was being redirected to prepare an Environmental Impact Statement on the potential relocation of Mound Plant functions. With the Secretary's decision to remain at Mound and with the termination of the relocation EIS, this funding is being used for its original purpose of supporting consolidation activities at Mound for stand-alone operations.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
< Capital equipment funding for routine equipment replacement at ORNL, LANL, and Mound and for developing, assembling and testing new power systems being developed. The increase in capital equipment funding in FY 2001 reflects purchase of two new glovebox furnaces at LANL.	1,312	500	800
Total, Radioisotope Power Systems	29,840	26,222	22,440
Special Applications			
# Satisfy user requirements to support ongoing and new national security programs.	2,000	2,000	2,000
Special Purpose Fission Power Technology			
# Complete interagency assessment of potential needs and translate user mission requirements into system design specifications. Define and evaluate system concepts focused on selected space applications. Perform investigations and technical assessments on candidate subsystem technologies and develop associated draft R&D plan for optional base technology effort. Evaluate facility infrastructure needs and support initial reviews on safety, environmental, and related programmatic considerations. Document interagency assessment results in a report to be provided to the Office of Science and Technology Policy and made available to members of Congress.	0	0	2,000

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Plutonium-238 Acquisition and Processing			
# Develop Pu-238 scrap and waste recovery and disposal capabilities at Los Alamos National Laboratory for reuse of Pu-238 for future national security and NASA space missions.			
< Complete installation of glove boxes, complete bench scale testing and complete installation and startup activities of scrap recovery line and proceed to full operation. Complete conceptual design and safety analyses for waste recovery line and waste recovery by-products disposal and proceed with installation. The decrease in funding for FY 2001 reflects transition to full operation of scrap recovery line	2,645	3,400	3,000
< Capital equipment funding for developing scrap recovery and waste recovery lines at LANL. Decrease in funding reflects completion of procurement of equipment for scrap recovery and the waste recovery lines.	415	300	0
# Evaluate and implement options for meeting near-term and long-term supply needs for Pu-238			
< Continue evaluation of DOE reactor facilities for domestic production of Pu-238 (including support of NEPA safety and environmental analysis), develop test target design, complete conceptual design of processing and storage facilities, and prepare draft environmental impact statement for domestic production of Pu-238 (now part of nuclear infrastructure programmatic EIS).	1,941	0	0
< Develop environmental and cost analyses to support NEPA review of domestic production of Pu-238. Maintain the option for establishing a domestic Pu-238 supply for future space missions. Continue evaluations of facilities required for domestic Pu-238 production, including lab-scale demonstrations of Np-237 pellet target irradiations and advanced conceptual design of processing and storage facilities that would be built if a decision were made to proceed with establishing a domestic Pu-238 production capability. The decrease in funding reflects completion of the environmental and cost analyses required to support a NEPA review...	0	2,060	0

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
< Continue to maintain the option for establishing a domestic Pu-238 supply for future space missions. Perform conceptual design studies for Neptunium-237 (Pu-238 feedstock) storage configurations in existing hot cell facilities assuming that a positive Record of Decision will direct the Department to transfer its Neptunium-237 (Np-237) inventory to a new location for use. Fabricate prototype Np-237 targets and initiate irradiation testing of prototype targets. Increase in funding reflects conceptual design activities for Np-237 storage in existing facilities and Np-237 target fabrication and irradiation testing.	0	0	1,100
< Capital equipment funding for test target fabrication, irradiations, and analyses..	0	0	500
Total, Plutonium-238 Acquisition and Processing	5,001	5,760	4,600
Small Business Innovative Research and Small Business Technology Transfer Programs			
# Small Business Innovative Research and Small Business Technology Transfer Programs.	0	159	160
Total, Advanced Radioisotope Power Systems	36,841 [a]	34,141 [b]	31,200

[a] Excludes $159,000 which was transferred to the SBIR/STTR program.

[b] Includes the contractor travel savings and general reduction distributed to this program.

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
Radioisotope Power Systems	
# The net decrease reflects the Department's efforts to reduce program and facility infrastructure with consolidation of activities as a stand-alone operation at Mound and to reduce long term generic technology efforts.	-3,782
Plutonium-238 Acquisition and Processing	
# A net decrease reflects transition of scrap recovery from installation to full operations and deferral of advanced conceptual design activities related to potential domestic production of Pu-238.	-1,160
Special Purpose Fission Power Technology	
# As part of its basic nuclear development charter, an assessment of special purpose fission power technology will be pursued with the initial focus on potential space applications.	2,000
Small Business Innovative Research and Small Business Technology Transfer Programs	1
Total Funding Change, Advanced Radioisotope Power Systems	-2,941

University Reactor Fuel Assistance and Support

Mission Supporting Goals and Objectives

In order to retain the capability in the U.S. to conduct research, address pressing environmental challenges, and help preserve the nuclear energy option, DOE must maintain the infrastructure necessary to educate and train the next generation of scientists and engineers. The University Reactor Fuel Assistance and Support program provides funding for U. S. university nuclear engineering programs and university research reactors, which play a major role in providing this education and training.

University nuclear engineering programs supply highly skilled workers to organizations active in fields such as electricity generation, medical research and supply, environmental restoration, and advanced materials, as well as to government agencies and national laboratories. To help ensure the continued viability of these programs, the Department provides assistance through activities such as the DOE/Industry Matching Grants program, which leverages public sector funds with private contributions in a 50/50 cost share arrangement. The Department also provides research funding to university nuclear technology programs through the Nuclear Engineering Education Research (NEER) program, and academic assistance to outstanding students and faculty through the Scholarships and Fellowships program with an added dimension for FY 2000 and FY 2001 that supports students at minority institutions in achieving nuclear engineering degrees at universities with a nuclear engineering department.

University research reactors in the United States form a fundamental and vital component of the national research and education infrastructure. Research conducted using these reactors is critical to many national priorities such as health care, materials science, and energy technology. Currently, there are 29 operating university research reactors at 27 campuses in 20 states. University reactors are the source of neutrons for research in such diverse areas as medical isotopes, human health, life sciences, environmental protection, advanced materials, lasers, energy conversion, and food irradiation. University research reactors directly support the development of highly qualified, technically knowledgeable personnel needed by national laboratories, private industry, the Federal government and academia, for basic and applied research critical to U.S. technological competitiveness. In addition, with the help of the Reactor Sharing program, many of the reactors serve as centers for education programs offered to other colleges and universities and high school students and teachers who visit the reactor for instructional programs and research.

The University Reactor Fuel Assistance and Support program provides funding for supplying fresh fuel to and shipping spent fuel from university research reactors through the Fuel Assistance program allowing universities to continue their important research and education activities. The Reactor Upgrade program provides funding for equipment upgrades at the reactors, to increase their value as research tools, while the radiochemistry program supports students and faculty in the discipline of radiochemical science, which supports the nuclear energy infrastructure of the nation. A new initiative in FY 2000, continuing in FY 2001, provides funding to prepare students for nuclear engineering and science careers by way of the Nuclear Education Recruitment program.

The Nuclear Energy Research Advisory Committee (NERAC) has recommended goals and objectives for the DOE nuclear programs. NERAC recommended the development of a long range strategic plan and the conduct of several reviews related to the university programs, including reviews of the condition of the university reactors and their utilization for teaching and faculty research. These activities will study options to support and upgrade these vital research tools. Within NERAC, a "Blue Ribbon Panel" has been convened and charged with considering the future of the U.S. nuclear education infrastructure, with particular focus on the future of the U.S. university research reactors and the relationship between universities and the national laboratories in the conduct of nuclear engineering research. The panel has representatives from universities, national laboratories and government. The long-term strategic plan and these reviews will formulate the basis for future university program budget recommendations.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
University Reactor Fuel Assistance and Support	11,000	12,000	12,000	0	0
Total, University Reactor Fuel Assistance and Support	11,000	12,000	12,000	0	0

Detailed Program Justification

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
University Reactor Fuel Assistance and Support			
# Continue to supply fresh fuel to and ship spent fuel from all university reactors requiring these services and may begin conversion of a university reactor from high enriched uranium (HEU) to low enriched uranium (LEU) during FY 2000 if funding is sufficient. Starting in FY 2001, fresh fuel will be supplied to the McClellan reactor, now operated by the University of California-Davis. No funds are available for reactor conversions at this level of funding during FY 2001.	2,300	2,800	2,800
# Continue the Matching Grants Program in FY 2001, which supports education, training, and innovative research at participating universities. Provide grants of up to $50,000 (which are matched by industry) to 17 universities in FY 1998, 21 in FY 1999 and 17 or more each year in FY 2000 (amount increases to $60,000) and FY 2001. Since the FY 2001 level has been reduced, several cost sharing arrangements with the universities may need to be scaled back or eliminated.	1,000	1,000	800
# In FY 2000, provide fellowships and scholarships to students enrolled in nuclear science and engineering programs at multiple U.S. universities. Fellowships will be provided to M.S. and PhD. students and scholarships will be provided to undergraduate students. Additionally, in FY 2000, the Department will provide support to students enrolled in minority serving institutions to pursue nuclear science and engineering degrees in cooperation with universities that grant those degrees. A total of 22 fellowships and 67 scholarships were awarded for FY 1999. Approximately 22-24 fellowships and 50 scholarships are expected for FY 2000 and FY 2001.	1,400	1,400	1,400

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
# The Reactor Sharing program allows students and faculty at institutions without reactors to have access to university reactors for training, education, and research purposes. This program also allows the universities with reactors to conduct educational outreach programs in their local communities. In FY 1999, FY 2000 and FY 2001, 23 grants were made or planned with the level of funding for individual reactors varying each year. While the number of recipients will remain constant, the level of funding at each of the research reactors will decline to accommodate the decrease in overall funding.	700	600	600
# Continue in FY 2001 with the fourth year of the reactor upgrade program to assist in addressing the backlog of maintenance and upgrade of items confronting university-owned research reactors. The program provides for replacement of outdated equipment, maintenance of reactor systems, and upgrading of experimental capabilities at 21 university reactors in FY 1999, and approximately 23 reactors each year in FY 2000 and FY 2001. The purpose of this program is to ensure that these valuable educational and research tools are available into the next decade.	800	845	900
# The Nuclear Engineering Education Research Grants Program was reinstated in FY 1998 with the awarding of 19 grants. In FY 1999, existing and new grants totaled 39 and in FY 2000 existing and new grants will total approximately 45 to provide for innovative research in nuclear engineering at U.S. universities. A few new grants will be awarded in FY 2001 since the funding primarily supports the grants continuing from previous years.	4,500	5,000	5,000
# Continue a program that began in FY 2000 to support nuclear engineering education recruitment activities in conjunction with a professional society with expertise in nuclear science and technology to ensure a highly informed group of students are available to enter university nuclear engineering and related scientific courses of study.	0	155	200

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
# In FY 2001, the radiochemistry program will continue awards made in FY 1999 to provide faculty support and student fellowships to help educate a new generation of radiochemists to address the technical challenges associated with radioactive wastes and contaminated sites. The FY 2001 request would restore the funding to the FY 1999 level, but no new awards can be made due to the commitments of prior year projects..	300	200	300
Total, University Reactor Fuel Assistance and Support	11,000	12,000	12,000

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
University Reactor Fuel Assistance and Support	
# Increased radiochemistry funding allows full funding of continuing projects.	100
# Increase reactor upgrade instrumentation at several reactors.	55
# Allows slightly expanded education recruitment program.	45
# Decrease in the number or level of funding for matching grants	-200
Total Funding Change, University Reactor Fuel Assistance and Support	0

Test Reactor Area Landlord

Mission Supporting Goals and Objectives

The Idaho Test Reactor Area (TRA) is located within the Idaho National Engineering and Environmental Laboratory (INEEL). Since the early 1950s, test reactors, laboratories, hot cells and supporting facilities have been built and operated there. Currently operating on the site are: (1) the Advanced Test Reactor (ATR), which is the world's largest and most advanced test reactor, (2) the ATR Critical Facility reactor, (3) the TRA Hot Cells which process and ship vital isotopes for medicine and are produced in the ATR (by a private sector firm under a commercialization agreement), (4) the INEEL Applied Engineering and Development Laboratories and (5) a major industrial machine shop facility that supports not only TRA facilities but also performs support work for all of INEEL. Vital nuclear reactor testing, isotope production and other scientific research are planned to continue until well into the twenty-first century.

TRA Landlord Mission Supporting Goals and Objectives:

- Ensuring an adequate maintenance program is conducted to maintain the site common facilities and utility infrastructure in accordance with the Department of Energy (DOE), Federal and State of Idaho environmental, safety and health (ES&H) standards and regulations and to ensure reliable program support for tenant programs.

- Ensuring an adequate upgrade construction program is conducted to the site buildings and utility infrastructure to meet programmatic, reliability and ES&H requirements. Most of the TRA Landlord buildings and utility systems are more than 40 years old, and, given the projected indefinite continuing mission of the site, upgrades must be made to the buildings and especially to the utility infrastructure as these facilities and systems are at or near the end of their useful life or do not meet current ES&H requirements.

- Ensuring environmental compliance for the site including identification of legacy waste and mitigation in accordance with DOE, Federal and State of Idaho regulations and specific legal agreements entered into with the State of Idaho.

Planned FY 2001 TRA Landlord accomplishments include: providing construction projects operating support, conducting routine maintenance and repair on common site facilities and utility systems, ensuring site environmental compliance including cleanup of legacy waste, procurement of General Purpose Capital Equipment (GPCE), and conducting General Plant Projects (GPP) and Line Item Construction Projects (LICP). The FY 2001 budget provides for continuation of the LICP to improve fire safety for the TRA site to meet current Federal, State and DOE fire safety standards. In July 1998, a malfunctioning carbon dioxide fire suppression system resulted in a fatality and multiple injuries. A Type A investigation was conducted by the Office of Environment, Safety and Health and appropriate actions were taken to ensure such an accident would not occur again. The principal fire safety improvements in FY 2001 will be continuing the process of upgrading fire doors, fire suppression systems, alarm systems, and smoke detectors. The FY 2001 budget provides for continuation of the TRA Electrical Utility Upgrade LICP to reconfigure the 40 year old electrical utility system to meet

current needs and to replace aged switchgear, panels and transformers for which maintenance parts are no longer available or which are at the end of useful life and beyond economical repair. The planned GPP for FY 2001 will provide a new potable water well and make required modifications to the potable water distribution piping to meet state and EPA drinking water standards.

It is important that the Department take action in FY 2001 to address the aging infrastructure of the site to ensure that programmatic, environment, safety and health requirements are met.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Operations and Maintenance	4,000	6,070	7,575	1,505	24.8%
Construction	2,766	2,833 [a]	1,425	-1,408	-49.7%
Total, Test Reactor Area Landlord	6,766	8,903 [a]	9,000	97	1.1%

[a] Includes the general reduction distribution to this program.

Detailed Program Justification

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Operations and Maintenance			
# Provide engineering, planning, development, design, project validation and construction management for the Fire & Life Safety LICP, the Electrical Utility Upgrade LICP and GPP projects.	815	950	1,135
# Continue required preventive maintenance and necessary routine repair activities to correct site deficiencies identified during facility inspections and assessments to ensure that TRA Landlord facilities are maintained in compliance with programmatic and ES&H requirements.	472	570	1,000
# Continue to procure GPCE to support TRA Landlord requirements.	140	240	340
# Conduct GPP such as drilling a new potable water well and making required modifications to potable water distribution piping to meet new, mandatory state and EPA drinking water standards.	1,290	1,110	1,600
# Continue environmental compliance legacy waste cleanup activities in accordance with DOE, Federal and State of Idaho regulations and specific agreements with the State of Idaho.	1,283	3,200	3,500
Total, Operations and Maintenance	4,000	6,070	7,575
Construction			
# Continue the TRA Fire & Life Safety LICP.	2,425	1,500	500
# Continue the TRA Electrical Utility Upgrade LICP.	341	1,333	925
Total, Construction.	2,766	2,833	1,425
Total, Test Reactor Area Landlord	6,766	8,903	9,000

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
Operations and Maintenance	
# Construction operating support escalated for inflation and for planning, formulation, and conceptual design of GPP and Line Item Projects such as the TRA Potable Water Well System, Communications Cabling Upgrade, Building Ventilation Systems, Site Paging and Evacuation System, and TRA Utility Upgrades.	185
# Maintenance and repair increased to accomplish necessary projected work scope. The backlog of maintenance over the past several years has increased steadily, with a current estimate of $1.9 million. Examples of deficiencies that need to be corrected include leaky roofs, plumbing and electrical deficiencies, configuration control (update "as-built" version of key facility drawings), window and lighting repairs.	430
# GPCE increased due to planned requirements. Funding is needed to purchase items such as three Raw Water Feed Pumps, two Motorized Man Lifts, and a Mobile Crane.	100
# GPP increased due to planned requirements. These planned GPP requirements are to support improvements in the aging infrastructure of TRA and include a new Potable Water Well System to meet new, mandatory State of Idaho and Environmental Protection Agency Drinking Water Standards.	490
# Projected requirements for Environmental Compliance increased in FY 2001 due to mandatory legacy waste cleanup activities. Such activities include TRA Waste (hazardous and radioactive) Tank Remediation, TRA Tank Assessments, characterization and disposition of legacy wastes, and disposition of irradiated beryllium from the ATR water canal.	300
Total, Operations and Maintenance	1,505

	FY 2001 vs. FY 2000 ($000)
Construction	
# The decrease in the TRA Fire & Life Safety LICP is due to a planned deferral in scope. Parts of this line item that will be delayed include repair/replacement of leaky firewater valves and piping risers and installation of a Firewater Backflow Prevention System.	-1,000
# The decrease in the TRA Electrical Utility Upgrade LICP is a planned decrease for replacing and/or upgrading TRA electrical distribution system components that support the TRA infrastructure. Types of components needing replacement or modification include switchgear, transformers, electrical panels, underground ductbanks, power cables, control wiring, and instrumentation and control equipment..	-408
Total, Construction	-1,408
Total Funding Change, Test Reactor Area Landlord	97

95-E-201, Fire and Life Safety Improvements, Idaho National Engineering and Environmental Laboratory, Idaho

(Changes from FY 2000 Congressional Budget Request are denoted with a vertical line [|] in the left margin.)

Significant Changes

The differences between the previous and current schedule estimates are based on adjustments to the project baseline due to target funding being less than planned. Work has been prioritized to minimize the impact on safety. Project work is divided into phases to allow for creation of independent sub-projects. This has facilitated rescheduling as the project funding profile has changed from the original plan. The schedules have been optimized to provide the A/E work completion based on the need for final reviews and for specification and drawing approvals to be accomplished just prior to final planning for work performance.

Due to the extended schedule, operating funds to support the project have increased by $44K to $1,920K, increasing the TPC from $17,322 to $17,366. Increases are due to extended project management coverage, escalation in costs for radiological controls, additional systems engineering, and other TRA operations support required to manage the schedule changes and priority adjustments.

The current estimate of related annual funding requirements has been revised to include annual operating costs of preventive maintenance for the Fire Water Pumps associated with this project ($31K). Based on the normal practice of continuous review of projects to look for opportunities for savings, further review revealed that $10K Annual Programmatic operating expenses reported previously could be deleted as not applicable.

"Physical Construction Complete" is changed from 4Q FY 2001 to 4Q FY 2005 as a result of the above changes.

1. Construction Schedule History

	Fiscal Quarter				Total Estimated Cost ($000)	Total Project Cost ($000)
	A-E Work Initiated	A-E Work Completed	Physical Construction Start	Physical Construction Complete		
FY 1995 Budget Request *(Preliminary Estimate)*	2Q 1995	4Q 1997	2Q 1997	4Q 1999	15,500	17,030
FY 1996 Budget Request	2Q 1995	4Q 1997	2Q 1997	4Q 1999	15,472	17,002
FY 1997 Budget Request	2Q 1995	1Q 1997	3Q 1995	4Q 1999	15,446	17,011
FY 1998 Budget Request	2Q 1995	1Q 1997	3Q1995	4Q 2000	15,446	17,011
FY 1999 Budget Request	2Q 1995	1Q 1997	3Q1995	4Q 2000	15,446	17,011
FY 2000 Budget Request	2Q 1995	1Q 2000	3Q 1995	4Q 2001	15,446	17,322
FY 2001 Budget Request *(Current Baseline Estimate)*	2Q 1995	2Q 2001	3Q 1995	4Q 2005	15,446	17,366

2. Financial Schedule

(dollars in thousands)

Fiscal Year	Appropriations	Obligations	Costs
Design/Construction			
1995	1,696	1,696	1,180
1996	1,900	1,900	1,140
1997	1,000	1,000	1,819
1998	4,425	4,425	548
1999	2,425	2,425	6,679
2000	1,500	1,500	1,500
2001	500	500	500
2002	500	500	500
2003	500	500	500
2004	500	500	500
2005	500	500	580

3. Project Description, Justification and Scope

Project Description

Numerous fire code deficiencies were documented in eight formal assessments conducted within all buildings and facilities of the TRA complex between 1989 and 1993. One hundred and forty-seven buildings and structures were individually reviewed for compliance with DOE Orders 5480.7, 5480.4, DOE-ID appendix 12044, DOE-ID 0550, National Fire Protection Association (NFPA) Codes, and industry good practices for improved risk.

From this effort, 684 recommendations were developed for fire protection improvements to ensure compliance with current regulations and national codes. Improvements have been ranked in priority order commensurate with available funding in order to ensure that extending completion to FY 2005 will have minimum impact on fire and life safety.

This project provides the following:

- Upgrade deficient fire barriers to meet code and reduce Maximum Possible Fire Loss (MPFL) or smoke damage impacts to personnel and property.

- Modifications to or installation of new automatic fire suppression systems to meet code requirements for operations personnel life safety and to reduce Maximum Credible Fire Loss (MCFL) potentials to acceptable improved risk levels as required by DOE Order 5480.7.

- Modifications to existing building heating and ventilating systems to: control fire and smoke spread; enhance smoke detection; upgrade or replace interior doors to provide smoke and fire barriers; provide protection of structural support members; and seal penetrations in fire barriers (existing walls and floors) to provide effective control of property damage and increase life safety protection.

- Modifications to the fire detection and alarm system to meet codes and to make the TRA system compatible with the Idaho National Engineering and Environmental Laboratory (INEEL) site wide fire alarm system.

- Addition of fully redundant water supply, consisting of new Underwriters Laboratories (UL)-listed and Factory Mutual (FM)-approved fire pumps and a tank capable of delivering 100 percent of the highest demand for volume, pressure, and duration, to meet requirements of DOE Order 5480.7.

- Additions or modifications to existing fire water distribution piping, hydrants and valves.

- This project has a direct positive impact on the safety of TRA by assuring a reliable and adequate fire water supply to critical site safety systems including the Advanced Test Reactor (ATR) nuclear safety systems.

- A DOE Fire Safety Appraisal, which was conducted in 1989, identifies the current capacity of the raw water storage tanks as deficient. The appraisal states that sufficient water must be on hand to supply the ATR Emergency Core Cooling System and a major plant fire simultaneously. This project will correct this deficiency.

- The Fire & Life Safety deficiencies identified have been divided into 11 work packages (phases) based on site areas and type of work activity to allow for accomplishment under a managed work plan. The packages (phases) have been developed for optimal subcontracting actions and to utilize the available qualified site crafts to accomplish the planned work in an efficient manner. The work is ongoing.

Justification

Justification/requirement to perform this project is based on the following studies, reports and evaluations.

- October 9, 1989, Study for Bringing Fire Protection Up to Code and Within Compliance Site-Wide - EWP-27-89.

- Power Reactor Programs - Risk Management Resource Manual developed by Power Reactor Programs Safety and Environmental Compliance - November 15, 1989.

- The Advanced Test Reactor as it relates to Compliance with USNCR 10CFR50 Appendix R Fire Protection Requirements performed in 1989 by Protection Consultants.

- Life Safety Code Review of Test Reactor Area Buildings 603, 657, 604, 606, 616, 622, 621, 625, 632, 635, 654, 637, 647, 649, 652, 653, 653A, 662, 657, 661, 661 Addition, 662, and 668 performed by Protection Consultants August 1989.

- Architectural Engineering Conceptual Design Report for TRA portion of the INEEL Fire and Life Safety Improvements Project issued April 12, 1990.

- Fire Protection Line Item Deficiencies From the Base Line Safety Audit by T. V. Kraft, November 25, 1991.

- Architectural Engineering Conceptual Design report for Test Reactor Area Fire and Life Safety Improvements Project issued February 25, 1992.

- April 15, 1993, report from D. M. Sherick to DOE-IDs R. V. Furstenau that highlighted certain FY 1995 F&LS Improvement Project activities that are of the highest priority since they address significant deficiencies that are currently in clear violation of a specific DOE order or national fire safety code.

The FY 1995 TRA Fire Protection Line Item Upgrade is part of and coordinated with the overall fire protection upgrade for the entire INEEL. A FY 1992 Site Wide Fire Protection Upgrade also involves facilities at TRA. Therefore, care has been taken to ensure that each upgrade is consistent in approach with the other, that all pertinent areas of the TRA Base Line Safety Audit are covered by the combined scope of both line items, that there are not redundant or overlapping areas of scope, and that the priorities are set accurately to address the risks posed.

Regulatory Drivers

Compliance with applicable sections of the Code of Federal Regulations, DOE and DOE-ID requirements, the NFPA and NEC.

NEPA Documentation - Finalization of Air Permit Completed in FY 1998. (As tasks are worked, continue review to ensure that all NEPA requirements are identified and met.)

Raw Water Storage Tank System to meet ATR seismic requirements, and simultaneously supply emergency cooling water with sufficient water for a major plant fire.

Scope

The project scope includes, but is not limited to, upgrade deficient fire barriers, modify or install new automatic fire suppression systems, modify existing building heating and ventilating systems, modify fire detection and alarm systems, adding a fully redundant water supply, and adding or modifying existing fire water distribution piping, hydrants and valves.

4. Details of Cost Estimate

	(dollars in thousands) Current Estimate	Previous Estimate
Design Phase		
Preliminary and Final Design Costs (Design Drawings and Specifications)	1,237	893
Design Management Costs (0.2% of TEC)	38	32
Project Management Costs (0.5% of TEC)	76	68
Total, Design and Management Costs (8.7% of TEC)	1,351	993
Construction Phase		
Improvements to Land	155	155
Buildings	6,235	8,160
Utilities	2,401	3,137
Standard Equipment	648	648
Inspection, design and project liaison, testing, checkout, and acceptance	797	708
Construction Management (8.4% of TEC)	1,291	251
Project management (4.2% of TEC)	656	711
Total, Construction Costs	12,183	13,770
Contingencies (12.4% of TEC)	1,912	683
Total, Line Item costs (TEC)	15,446	15,446

5. Method of Performance

The Department of Energy Idaho Operations Office (DOE-ID) is responsible for project validation and oversight of the project, including selection of principal contractors (i.e., INEEL Operating Contractor) and approval of specified procurement actions. DOE-ID project management is performed by the Construction Management Group in the Office of Program Execution. Safety, environmental and other project support is furnished to the project on an as-needed basis by the DOE-ID matrix organization.

The design, project management, and construction management is performed under a negotiated contract with the operating contractor. Construction and procurement will be accomplished by fixed price contracts awarded on the basis of a competitive, Best Value bidding process. Inspection may be performed by another agent. Check-out of systems and maintenance of the completed project is performed by the operating contractor.

The INEEL Operating Contractor's (OC) Project Manager is responsible for the entire project including design, all construction activities at the TRA/INEEL site, construction subcontracting, direction of the activities of construction subcontractors, and performance and management of construction activities as required to complete the project in a timely, safe, and cost-effective manner.

6. Schedule of Project Funding

(dollars in thousands)

	Prior Years	FY 1999	FY 2000	FY 2001	Outyears	Total
Project Cost						
Facility Cost						
Design	956	25	12	0	0	993
Construction	3,731	6,654	1,488	500	2,080	14,453
Total, Line Item TEC	4,687	6,679	1,500	500	2,080	15,446
Other Project Costs						
Conceptual design costs	350	0	0	0	0	350
NEPA documentation costs	39	12	2	0	0	53
Other project-related costs	934	259	280	44	0	1,517
Total Other Project Costs	1,323	271	282	44	0	1,920
Total, Project Cost (TPC)	6,010	6,950	1,782	544	2,080	17,366

7. Related Annual Funding Requirements

(FY 2003 dollars in thousands)

	Current Estimate	Previous Estimate
Annual Facility operating costs	31	1
Annual Programmatic operating expenses directly related to the facility	0	10
Total related annual funding	31	11
Total operating costs *(operating from (2002 through FY 2006)*	155	55

99-E-200, Electrical Utility Upgrade, Idaho National Engineering and Environmental Laboratory, Idaho

(Changes from FY 2000 Congressional Budget Request are denoted with a vertical line [|] in the left margin.)

Significant Changes

Requested funding for FY 2001 is $925K, $1,314 less than originally planned. Thus project completion will occur in 4Q FY 2004 instead of 1Q FY 2004. The project's TEC has increased by $295K due to additional design and construction costs associated with new mandatory work control procedure implementation, safety guidelines, and escalation and costs associated with funding deferral.

Design costs have escalated by $334K (including Design Contingency) to cover cost increases for additional design management, project management, work control, reviews, design contingency and safety procedures mandated by the funding deferral. Construction costs have increased by $268K for escalation associated with the funding deferral. Project & Construction Management, Inspection, Design and Project Liaison, Testing, Checkout and Acceptance costs were reduced by $216K based on information from aggressive and continuing planned reviews of cost estimates. The project construction start has been delayed from 4Q FY 2000 to 4Q FY 2001 (resulting in a no cost increase for FY 2000 construction) to optimize the schedule because the new funding profile would cause extreme fragmentation and inefficiency of subcontract scope if the construction phase progressed as funded. Offsetting the increase in construction costs is a $91K reduction of construction contingency that will leave the project with a reserve of 21% of gross construction costs, which is an acceptable reserve.

1. Construction Schedule History

	Fiscal Quarter				Total Estimated Cost ($000)	Total Project Cost ($000)
	A-E Work Initiated	A-E Work Completed	Physical Construction Start	Physical Construction Complete		
FY 1999 Budget Request *(Preliminary Estimate)*	2Q 1999	3Q 2000	3Q 2000	3Q 2002	6,700	7,320
FY 2000 Budget Request	2Q 1999	3Q 2000	4Q 2000	1Q 2004	6,700	7,560
FY 2001 Budget Request *(Current Baseline Estimate)*	2Q 1999	3Q 2001	4Q 2001	4Q 2004	6,995	7,937

2. Financial Schedule

(dollars in thousands)

Fiscal Year	Appropriations	Obligations	Costs
Design/Construction			
1999	341	341	341
2000	1, 333	1, 333	1,333
2001	925	925	925
2002	1,047	1,047	1,047
2003	2,200	2,200	2,200
2004	1,149	1,149	1,149

3. Project Description, Justification and Scope

The Test Reactor Area (TRA) was established in the early 1950's with the development of the Materials Test Reactor. Two other major test reactors as well as other facilities followed. The electrical distribution system supplying power to these programs was installed in accordance with the applicable codes and standards of the day but has not been upgraded to remain compliant with current safety and construction codes. The equipment is deteriorated and obsolete, and now is becoming unreliable. Repair parts are difficult to acquire or completely unavailable.

Over the past 40 years, numerous modifications to the configuration of the system have been accomplished. These modifications, while providing immediate solutions to specific problems, did not always address optimum system operation. These changing requirements have resulted in overloading of some parts of the electrical system equipment. Plans and drawings of the system have not kept up with all the modifications and are unreliable, which poses a clear safety hazard to personnel operating and maintaining the system.

This project addresses: (1) the need to bring the system into compliance with current codes and standards, (2) the inadequate configuration that has developed over time, and (3) the need to replace obsolete, deteriorated system equipment that can no longer be maintained. Failure to correct these deficiencies will result in system unreliability and significant personnel safety hazards.

An external, independent review of this project conducted in June 1999, in response to a Congressional mandate for such reviews, strongly endorsed the need for this project, found the project well planned and recommended accelerated funding. However, continuing fiscal constraints have not allowed for project acceleration.

The TRA Electrical Utility Upgrade Project provides for the design, procurement, and construction activities to correct the above described general system deficiencies in the 13.8kV and 5kV class equipment at the TRA. The work scope of this project provides:

a. Increased reliability by replacement of 30 to 40 year old switchgear, transformers and panels. The old equipment is subject to failure, spare parts unavailability, and unreliable operation increasing the risk of interruptions to down stream equipment.
b. An upgrade of the standby power system. The standby power system is used to supply emergency power to the breakers during power failures so that breaker operation can be maintained. The standby power system is 45 years old and subject to frequent failure and unavailability of spare parts. Equipment in use contains hazardous materials (lead, PCBs, asbestos), and must be removed.
c. Consolidation and reconfiguration of the electrical distribution system to make the system more efficient, remedy safety hazards, and provide for future planned expansion. Consolidation of the system will reduce the amount of switchgears required and result in an overall savings to the government by significantly reducing maintenance costs in future years.
d. Standardization of switchgear will result in reduced training costs and a significantly lower safety risk for operators and maintenance personnel.
e. Reconfiguration to remove parts of the electrical distribution system currently housed in otherwise shutdown facilities. This will allow for demolition of these unneeded facilities by the Office of Environmental Management which will result in a significant overall savings to the government by eliminating maintenance costs.
f. A significant reduction in fire hazards. An obsolete, deteriorated switchgear will be replaced with modern equipment designed to current fire safety code requirements.

The project scope includes, but is not limited to, replacement of selected switchgear and facility transformers, modifications to electrical services and panels, construction of underground ductbanks, replacement of power cables and control wiring, and modifications to instrumentation and control equipment.

The requested FY 2001 funding will be used to complete design activities and start construction activities.

4. Details of Cost Estimate

(dollars in thousands)

	Current Estimate	Previous Estimate
Design Phase		
Preliminary and Final Design Costs (Design Drawings and Specifications)	600	387
Design Management Costs (0.2% of TEC)	17	9
Project Management Costs (1.6% of TEC)	114	58
Total, Design and Management Costs (10.5% of TEC)	731	454
Construction Phase		
Utilities	3,834	4,043
Inspection, Design and Project Liaison, Testing, Checkout and Acceptance	249	278
Construction management (6.1% of TEC)	426	252
Project management (8.1% of TEC)	566	449
Total, Construction Costs	5,075	5,022
Contingencies (17.0% of TEC)	1,189	1,224
Total, Line Item costs (TEC)	6,995	6,700

5. Method of Performance

The Department of Energy Idaho Operations Office (DOE-ID) will be responsible for project validation, implementation of the project (including selection of principal contractors) and approval of specified procurement actions. DOE-ID project management will be performed by the Construction Management Group in the Office of Program Execution. Safety, environmental, and other project support will be furnished to the project on an as-needed basis by the DOE-ID matrix organization.

The design, project management, and construction management will be performed under a negotiated contract with the operating contractor. Construction and procurement will be accomplished by fixed price contracts awarded on the basis of competitive bidding. Inspection may be performed by another agent. Check-out of systems, and maintenance of the completed project will be performed by the operating contractor.

The INEEL operating contractor Project Manager will be responsible for the entire project.

6. Schedule of Project Funding

(dollars in thousands)

	Prior Years	FY 1999	FY 2000	FY 2001	Outyears	Total
Project Cost						
Facility Cost						
Design	0	341	1,333	97	0	1,771
Construction	0	0	0	828	4,396	5,224
Total, Line item TEC	0	341	1,333	925	4,396	6,995
Other project costs						
Conceptual design costs	132	0	0	0	0	132
NEPA documentation costs	4	0	0	0	0	4
Other project-related costs	128	23	111	118	426	806
Total other project costs	264	23	111	118	426	942
Total, Project Cost (TPC)	264	364	1,444	1,043	4,822	7,937

7. Related Annual Funding Requirements

(FY 2003 dollars in thousands)

	Current Estimate	Previous Estimate
Total related annual funding	0	0

Nuclear Energy Plant Optimization

Mission Supporting Goals and Objectives

Environmental issues associated with the Clean Air Act and global climate change are increasing in importance. To reduce the harmful impact of burning fossil fuels on the environment, the President initiated a comprehensive strategy that combines increased energy efficiency with greater use of nuclear and renewable energy. The nuclear energy element of the President's initiative is the Nuclear Energy Plant Optimization program (NEPO). The U.S. electricity sector has entered a period of change and uncertainty. With the deregulation of electricity production, many unprecedented issues are challenging utilities, regulators, and the Federal Government. New technologies are altering the fuel choices made by utility planners. Environmental regulations and competition are causing the closure of older fossil-fuel plants, and many U.S. nuclear plant owners are approaching a critical decision point as to whether their plants should be shutdown at or before their initial license period, or whether they should apply for a twenty-year license extension.

The DOE's Energy Information Administration (EIA) anticipates that, even with aggressive implementation of energy efficiency measures, U.S. electricity consumption will increase 1.4 percent each year through 2020 – the equivalent of building seven large 1000-megawatt power plants every year. Additionally, EIA projects that between FY 1999 and FY 2020, approximately 89,000 megawatts of existing electricity generating capacity will be retired because of age, competitive pressures, and as part of U.S. utility efforts to meet clear air standards. As a result, the EIA estimates the U.S. must build the equivalent of 1,000 new fossil fuel generating plants by 2020 to meet growth in demand and offset plant retirements. Building these plants will require a huge economic investment in new baseload generating capacity during the next two decades, and when in operation, these plants will emit large quantities of air emissions. According to EIA, nuclear energy could be key to reducing carbon emissions.

Continued operation of existing nuclear plants through their original license term and a 20-year renewed license term would partially mitigate the need to build more baseload power plants. Existing U.S. nuclear power plants are a vital component of the U.S. energy diversity strategy. Nuclear power plants have operated safely and reliably in the U.S. for decades and are capable of doing so for many decades to come. These plants provide nearly a fifth of the electricity generated in the United States. They operate year-round, in all weather conditions without emitting air pollutants.

Nuclear energy is the only proven large-scale power source that has unlimited potential to provide clean and reliable electricity into the next century. Nuclear power plants do not produce environmentally damaging emissions such as carbon dioxide and oxides of nitrogen and sulfur. Between 1973 and 1997, nuclear generation avoided emission of 2.47 billion metric tons of carbon. Over the same period, use of nuclear energy avoided emission of 82.2 million tons of sulfur dioxide and more than 37 million tons of nitrogen oxides. As much as 90 percent of the carbon dioxide avoided by U.S. utilities over the last 25 years is attributable to nuclear energy. Continued operation of existing nuclear power plants annually

avoids over 150 million metric tons of carbon, about five million tons of sulfur dioxide, and 2.4 million tons of nitrogen oxides. Nuclear energy's avoidance of greenhouse gas emissions and other pollutants, therefore, is necessary to help the U.S. meet its international commitments to address concerns for global warming.

Globally, nuclear energy is growing in importance as an energy source for expanding economies. U.S. nuclear technology is often the preferred option for countries seeking the best in safety, efficiency, and economics. U.S. leadership in these markets has been of great strategic importance to the United States, because it provides this Nation with a prime seat at the table with other countries as they explore and implement nuclear power technologies. This presence has enabled the U.S. to exercise great international leadership in areas such as nuclear safety, non-proliferation, trade, and the environment.

The U.S. is at a critical juncture with regard to the continued operation of its nuclear power plants. Licenses for U.S. nuclear power plants will begin to expire in large numbers in 2010; licenses for 13 plants representing some 11,700 MWe will expire in 2014 alone. Many of the existing nuclear power plants are among the most cost-effective producers of electricity in the country. Reliance and demand on nuclear power plants will continue to increase because of environmental concerns and deregulations of the electric power industry. Recognizing the economic potential of continued operations, two utilities have applied for 20-year license renewal of their plants. It is clear that many other utilities will follow this example.

Despite the United States' long experience with nuclear power, it is important to recognize that no nuclear power plant has yet operated for its full 40-year initial license period. Continued reliable operation of these plants will require that complex technical issues associated with long-term operation be addressed. As long-term operation of existing nuclear power plants serves strategic national interests for economic strength, energy security, and environmental quality, the Government has the responsibility to address the difficult technology issues which the industry cannot address on its own.

The President's Committee of Advisors on Science and Technology (PCAST) Panel on Federal Energy R&D identified the critical role of nuclear power in its report of November 5, 1997. The Panel's report recommended that the Department work with its laboratories and industry to develop a program to address the problems that may prevent the continued operation of existing nuclear power plants. The panel recommended that DOE fund such a program at $10 million per year, to be matched by industry.

Recognizing the broad national strategic interests served by nuclear power and consistent with the Comprehensive National Energy Strategy, the Department proposed a new NEPO program starting in FY 2000 in response to the recommendations of PCAST. As a cost-shared program with the industry, NEPO seeks to develop and apply new technologies to improve plant reliability, availability, and productivity while maintaining a high level of safety. Overall, NEPO aims to help increase the average capacity factor of existing nuclear power plants from 78 percent in 1998 to 85 percent by 2010. The Department, national laboratories, and the electric utility industry's Electric Power Research Institute (EPRI) developed the *Joint DOE-EPRI Strategic Research and Development Plan to Optimize U.S. Nuclear Power Plants*. This report, first issued on March 20,1998, utilized input from the national laboratories, NRC, and other key stakeholders. The purpose of this Strategic Plan, which will be updated in FY 2000, is to help the Federal Government and private sector jointly identify, prioritize, and

execute the essential R&D needed over the next 10 to 12 years to sustain and enhance operation of existing nuclear power plants, based on strategic national goals that both industry and government endorse. The Subcommittees on Operating Nuclear Power Plant Research, Coordination, and Planning, and on Long Range Planning for Nuclear Energy Research of the Nuclear Energy Research Advisory Committee (NERAC) provide the Department advice on the conduct of the NEPO research and development program including criteria for prioritizing the research. A Coordinating Committee with representatives from utilities, national laboratories, universities, and NRC has been established. This Coordinating Committee works directly with the NERAC Operating Plant Subcommittee and prioritizes the R&D tasks and guides the update of the Joint DOE-EPRI Strategic R&D Plan.

The goal of the NEPO program is to ensure that current nuclear plants can continue to deliver adequate and affordable energy supplies up to and beyond their initial 40-year license period by resolving open issues related to plant aging, and by applying new technologies to improve plant reliability, availability, and productivity. The objectives related to this goal are:

- Managing long-term effects of component aging: component and structural material degradation occurs in nuclear plants as a result of long-term operation and exposure of materials to harsh environmental conditions. R&D conducted under NEPO will provide a better understanding of degradation mechanisms and how they occur, enabling development of cost-effective aging management strategies which will provide capabilities to easily prevent, detect or repair the degradation.

- Improving generation efficiency and productivity: this objective focuses on improving the long-term economic performance of current plants through development of technologies that will improve equipment reliability, lower operating costs, and increase power output while maintaining high levels of safety. Current nuclear plants were designed and are operating with technology developed over twenty-five years ago. As these nuclear plants age, components and parts degrade or become obsolete, introducing inefficiencies, added costs, and unreliability. There have been significant technology advancements over the past twenty-five years that are applicable to power generation, particularly in computers, communications, materials, sensors and digital electronics, and artificial intelligence, providing more accurate, reliable and cost-effective technologies. Further research and technology developments will produce new technology applications that will make nuclear plant operation and maintenance processes more economical and increase overall plant output. Demonstrations of technology performance will be an integral part of this R&D effort in order to achieve regulatory acceptance of these new technologies.

The R&D performed by the utility industry - totaling approximately $80 million each year - is critical to the maintenance of safe and economic operation of U.S. nuclear power plants. However, the nuclear industry's primary interest is to invest most of its R&D spending on short-term payback, low-risk activities that are needed to enhance day-to-day operational performance and safety. DOE's role in nuclear energy R&D is the same as in other areas of DOE energy research: to address the difficult technology issues that it is better equipped to solve than industry--because of the unique facilities and capabilities available to DOE, the lack of market incentive for industry to develop technologies important to the national interest, or because of the long-term and/or high-risk nature of the research.

The Department and the Nuclear Regulatory Commission (NRC) have established close coordination in research program planning to assure that the work performed by each organization is complementary to the other, cost-effective, and without duplication. A DOE-NRC Memorandum of Understanding was signed on August 16, 1999, to cooperate and share information and costs for research associated with nuclear power technology. The role of the NRC is very different from that of DOE. DOE's role is to develop technologies to address operational issues at nuclear power plants. NRC's role is to assure that it can provide the public with independent assurance that the technologies developed by DOE or industry for use in nuclear power plants are safe. NRC conducts confirmatory research as part of its responsibility to develop rules or regulations for use of new technology in nuclear power plants. The Department anticipates a close, ongoing relationship with NRC to assure that the two agencies make the best use of tax payer resources.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Nuclear Energy Plant Optimization	0	4,845	4,868	23	0.5%
SBIR	0	131	132	1	0.8%
Total, Nuclear Energy Plant Optimization	0	4,976 [a]	5,000	24	0.5%

[a] Includes the general reduction distributed to this program.

Detailed Program Justification

(dollars in thousands)

	FY 1999	FY 2000	FY 2001
Nuclear Energy Plant Optimization			
# NEPO, a new program in FY 2000, will continue in FY 2001 to address the challenges associated with the long-term operation of existing nuclear power plants. At the FY 2001 requested funding level, no new critical R&D can be undertaken unless cooperative activities initiated in FY 2000 are reduced in scope, delayed, or terminated. Also, the Department is not able to conduct all the critical research needed to resolve generic issues important to license renewal as noted by the NERAC *Subcommittee for Operating Nuclear Power Plant Research, Coordination, and Planning*. NERAC approved the critical R&D identified in the Joint DOE-EPRI Strategic Plan and recommended a funding level of twice the requested level. Areas where additional critical research is needed include replacement of obsolete analog systems with modern digital systems, human factors, radiation effects on materials, and techniques to inspect components and structures inaccessible to inspection techniques available today. Funds provided by DOE will be matched by industry in conducting the proposed peer-reviewed R&D to include: managing long-term effects of component aging; improving nuclear power plant capacity factors; and generation optimization through efficiency and productivity improvements. The activities funded under NEPO will be closely coordinated with the Nuclear Regulatory Commission and based on the critical R&D needs defined in the Joint DOE-EPRI Strategic R&D Plan to Optimize U.S. Nuclear Power Plants.	0	4,845	4,868

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Small Business Innovative Research and Small Business Technology Transfer Programs			
# Small Business Innovative Research and Small Business Technology Transfer Programs	0	131	132
Total, Nuclear Energy Plant Optimization	0	4,976	5,000

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
Nuclear Energy Plant Optimization	
# The FY 2001 requested funding level of $5 million is the same as that for FY 2000. The change reflected here exists because of the general reduction distributed to the program for FY 2000.	23
Small Business Innovative Research and Small Business Technology Transfer Programs	1
Total Funding Change, Nuclear Energy Plant Optimization.	24

Nuclear Energy Research Initiative

Mission Supporting Goals and Objectives

The Nuclear Energy Research Initiative (NERI) and the proposed International Clean Energy Initiative/International Nuclear Energy Research Initiative (I-NERI) provide for research and development of new technologies to address the key issues affecting the future of nuclear energy, in particular, the cost of constructing and operating nuclear power plants, remaining concerns regarding safety and proliferation, and the continuing challenges associated with nuclear waste. In responding to these issues, the NERI/I-NERI program funds innovative scientific and engineering research in areas such as proliferation resistant reactors and fuel cycles; new reactor designs with improved performance, lower cost, and enhanced safety; low output power and special use reactors; and new techniques for managing nuclear waste. [a]

A primary mission of the Department of Energy is to help assure that the United States maintains a flexible and diverse portfolio of energy supply options to power economic growth and enhance the quality of life for the American people. Nuclear energy currently provides one-fifth of U.S. electricity generation and can contribute a significant portion of U.S. electrical energy production for many years to come. As we enter a new millennium, the Nation faces new issues associated with energy supply and environmental policy. The potential role of nuclear power to address these new challenges, such as global climate change, will depend upon the ability of the Federal Government, universities, national laboratories, industry, and others to pool their talents and creatively address the key challenges affecting the future of nuclear energy.

The United States has always been a world leader in both the policy and technical aspects of nuclear energy. The United States has more nuclear power plants in operation today than any other nation and most of the world's operating nuclear power plants are based on the pioneering efforts of the U.S. light water reactor technology development. Given the projected growth in global energy demand as developing nations industrialize; our vital strategic interests in addressing global climate change, nuclear non-proliferation, nuclear safety, and economic competitiveness; and our need to satisfy growing domestic needs for energy in an environmentally responsible manner, the United States must maintain its scientific and technological leadership in nuclear energy. This leadership provides the U.S. a key “seat at the table” at on-going international discussions regarding the future implementation of nuclear technologies, nuclear non-proliferation, nuclear safety and many other issues important to U.S. policy objectives.

While nuclear power presents significant environmental and other benefits, several important issues impede nuclear energy's future--among these are issues related to the disposal of nuclear waste; international concerns about nuclear materials proliferation; public concerns about safety, and nuclear

[a] As noted in the “Federal Energy Research And Development For The Challenges Of The Twenty-First Century” Report of the Energy Research and Development Panel, The President’s Committee of Advisors on Science and Technology (PCAST), November 1997

power's problematic economic record in the United States. Industry and government share in the responsibility for these problems and it is in the long-term strategic interests of the Nation that they be addressed and resolved. However, current trends in industry, government, and universities are in contrast with the vital strategic needs of the Nation:

- Because of the lack of near-term economic incentives to conduct long-term research, U.S. industry's support of advanced nuclear research is almost nonexistent;

- University nuclear engineering and research programs face severe challenges and reduced funding; and

- Funding for the Federal Government's nuclear energy research activities has been sharply reduced over the last decade.

Recognizing the important national need to address these issues, the President's Committee of Advisors on Science and Technology (PCAST) Panel on Federal Energy Research and Development determined that establishing nuclear energy as a viable and expandable option was important, and recommended that the Department establish a new nuclear energy research program to address the key issues affecting the future use of nuclear energy. Specifically, the PCAST panel recommended the Department initiate a new nuclear energy research initiative based on competitive selection of research proposals from the national laboratories, universities and industry to conduct research in " proliferation-resistant reactors or fuel cycles; new reactor designs with higher efficiency, lower-cost, and improved safety to compete in the global market; lower output reactors for use where large reactors are not attractive; and new techniques for on-site and surface storage and for permanent disposal of nuclear waste."

The 1999 PCAST report on International Cooperation on Energy Innovation recommended that $10 million be included for the FY 2001 budget for an international component to NERI. The May 1999 PCAST report specifically describes the need for an I-NERI program to promote "bilateral and multilateral research focused on advanced technologies for improving the cost, safety, waste management, and proliferation resistance of nuclear fission energy systems." Furthermore, the 1999 PCAST report states that: "The costs of exploring new technological approaches that might deal effectively with the multiple challenges posed by conventional nuclear power are too great for the United States or any other single country to bear, so that a pooling of international resources is needed... Research efforts underway in Russia, Germany, Japan, South Africa, and South Korea on a variety of advanced reactor types and proliferation-resistant fuel cycles are potentially suitable foci for U.S. participation...".

The Department endorsed these recommendations, and established the NERI program, for which Congress initially appropriated $19 million in FY 1999. In addition to the established NERI program, the Department proposes in FY 2001 to launch a new initiative within NERI, the *International Clean Energy Initiative/International Nuclear Energy Research Initiative (I-NERI)*, to enhance the Department's ability to leverage the research funding available in other countries to develop new technologies to address the key issues affecting the future of nuclear energy. I-NERI will give the United States and the DOE greater credibility and influence in international discussions regarding the future implementation of nuclear technologies and those areas that are important to U.S. policy

objectives. It will allow us to leverage international resources, foster international cooperation, and work with countries such as Japan, France, South Africa, and South Korea on a variety of advanced nuclear technologies.

The NERI/I-NERI program is directed toward the following objectives:

- Develop advanced concepts and scientific breakthroughs in nuclear fission and reactor technology to address and overcome the principal technical obstacles to the expanded use of nuclear energy in the U.S.;

- Advance the state of nuclear technology to maintain a competitive position in overseas markets and a future domestic market;

- Promote and maintains a nuclear science and engineering infrastructure to meet future technical challenges;

- Provide an effective means to collaborate with international agencies and research organizations to address nuclear technology development on a world-wide, leveraged, cost-shared basis.

- Promote U.S. leadership and partnerships in bilateral and multilateral nuclear energy research.

Both NERI and I-NERI feature a competitive, investigator-initiated, peer-reviewed selection process to fund innovative nuclear energy-related research. The NERI program solicits proposals from the scientific and engineering community for research at universities, national laboratories and within the industry. NERI encourages collaborative research and development activities among these different research organizations; as well as the involvement of foreign research organizations. The Department believes that by funding creative research ideas at the Nation's science and technology institutions and companies, the United States will find new solutions to issues such as nuclear safety, power plant economics, proliferation, and nuclear waste. NERI program funding is being utilized to fund the research and development activities and the independent objective merit-peer review process used to evaluate the proposals submitted.

The I-NERI program component allows for research opportunities with foreign collaborators through a specified cost share arrangement with each participating country. The I-NERI program will also feature a competitive, investigator-initiated peer reviewed selection process that will include both U.S. reviewers as well as international expert reviewers from the particular participating country.

The Office of Nuclear Energy, Science and Technology manages the NERI and I-NERI programs and works closely with the Office of Science to ensure that the program’s approach to peer review is consistent with the good practices established by that office. NERI and I-NERI activities are coordinated with other relevant DOE program offices to assure that the best use is made of the Department's financial, intellectual, and physical resources.

The NERI research areas selected in FY 1999 for the first 3-year funding period include:

- Proliferation Reactor and Fuel Cycle Technology
- New Reactor Designs with Higher Efficiency, Low Output, and Reduced Cost
- Advanced Nuclear Fuel
- New Technologies for Management of Nuclear Waste
- Fundamental Science and Technology

In FY 1999, 308 NERI research proposals representing about $350 million in advanced research were received by the Department. 46 proposals were selected for awards based on the recommendations of the peer-review process. These 46 NERI R&D awards represent individual and collaborative research efforts by 45 separate organizations including 20 universities, 8 national laboratories, 16 industrial organizations, and 1 government R&D agency. The FY 1999 NERI awards also include significant international collaboration with 4 foreign universities, 5 industrial companies and one government R&D organization participating.

In response to the FY 2000 NERI solicitation, the Department has received a significant number of initial notices of intention to submit proposals indicating a high level of interest from U.S. laboratories, industry and universities. Approximately 20 percent of these initial responses had foreign collaborators identified that were willing to contribute in-kind research support. While the FY 2000 NERI appropriation can only provide approximately $3 million for new research projects, the momentum from the FY 1999 project awards and the initial response to the FY 2000 solicitation demonstrates that there is a strong global interest in this program.

International R&D collaboration with U.S. universities, national laboratories and industry in NERI research provides additional value to the NERI program by leveraging U.S. funding with foreign research funds and providing access to scientific and technical expertise, and research facilities that may not be available in the U.S.

NERI/I-NERI is managed by the Office of Nuclear Energy, Science and Technology with oversight and advice provided on a periodic basis by the Nuclear Energy Research Advisory Committee (NERAC). NERAC provides oversight of the NERI research focus and peer-review selection process. In addition, NERAC conducts evaluations and provides advice on the long-term nuclear energy research agenda. In early FY 2000, the NERAC Subcommittee on Long Term Planning for Nuclear Energy Research will conduct several workshops and develop a recommended long-term research and development plan for the Office of Nuclear Energy, Science and Technology. This plan will help guide the long-term focus of the NERI program.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Nuclear Energy Research Initiative	18,496	21,796	27,258	5,462	25.1%
International Clean Energy Initiative/International Nuclear Energy Research Initiative	0	0	6,814	6,814	100.0%
SBIR	0	596	928	332	55.7%
Total, Nuclear Energy Research Initiative	18,496 [a]	22,392 [b]	35,000	12,608	56.3%

[a] Excludes $504,000 which was transferred to the SBIR/STTR program.

[b] Includes the general reduction distributed to this program.

Detailed Program Justification

(dollars in thousands)

FY 1999	FY 2000	FY 2001

Nuclear Energy Research Initiative

Continue the NERI program initiated in FY 1999 to stimulate innovative research to address the difficult issues that compromise nuclear energy's potential as a viable and expandable future electricity option. DOE proposed the NERI program to encourage innovation and foster new ideas from our nation's leading researchers at universities, national laboratories and industry to address the issues of proliferation, nuclear waste, reactor safety and nuclear plant economics. In response to the FY 1999 NERI solicitation, the Department received 308 R&D proposals, of which 46 were selected for awards with periods of performance up to 3 years. These 46 NERI awards represent the individual and collaborative research efforts by 45 separate organizations including 20 universities, 8 national laboratories, 16 industrial organizations and 1 government R&D agency. Significant foreign collaboration was part of the 46 awards with 4 foreign universities, 5 foreign industrial organizations and 1 foreign government R&D organization participating. The FY 1999 NERI awards were in the areas of Proliferation Reactor and Fuel Cycle Technology; New Reactor Designs for Improved Performance, Higher Efficiency, Low Output, and Reduced Cost; Advanced Nuclear Fuel; New Technologies for Management of Nuclear Waste; and Fundamental Science and Technology.

The first year of the FY 1999 research awards were funded with FY 1999 appropriations, and the second and third years with FY 2000 and FY 2001 appropriations, respectively. The FY 2000 solicitation will also request new proposals with periods of performance up to 3 years. Approximately seven new research awards are expected to be made in FY 2000.

The requested FY 2001 funding will be used to continue the 46 research projects awarded in FY 1999 and the 7 research projects to be awarded in FY 2000. The FY 2001 request also provides funding to award approximately 15 new NERI projects during FY 2001. . . . . 18,496 21,796 27,258

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
International Clean Energy Initiative/International Nuclear Energy Research Initiative			
# Initiate, in FY 2001, the International Clean Energy Initiative/International Nuclear Energy Research Initiative (I-NERI) to promote foreign collaborative research focused on advanced technologies for improving the cost, safety, waste management, and proliferation resistance of advanced nuclear energy systems through specific cost share arrangements with each participating country. Conduct long-term nuclear technology research in the areas of new and innovative reactor designs, proliferation-resistant fuel cycles, nuclear science and engineering with particular countries under bilateral agreements.	0	0	6,814
Small Business Innovative Research and Small Business Technology Transfer Programs			
# Small Business Innovative Research and Small Business Technology Transfer Programs.	0	596	928
Total, Nuclear Energy Research Initiative	18,496 [a]	22,392 [b]	35,000

[a] Excludes $504,000 which was transferred to the SBIR/STTR program.

[b] Includes the general reduction distributed to this program.

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
Nuclear Energy Research Initiative	
# Increase funding for Nuclear Energy Research Initiative resulting in approximately 15 new awards in FY2001 for domestic NERI	5,462
International Clean Energy Initiative/International Nuclear Energy Research Initiative	
# Initiate in FY 2001 the International Clean Energy Initiative/International Nuclear Energy Research Initiative	6,814
Small Business Innovative Research and Small Business Technology Transfer Programs	332
Total Funding Change, Nuclear Energy Research Initiative	12,608

Termination Costs

Program Mission

The Termination Costs program is a key component of the Department's energy supply and research mission and supports the DOE strategic goals and objectives as documented in the DOE Strategic Plan and the DOE Performance Plan. The name of this program, however, is inconsistent with its true mission. It has been used to manage the short-term termination of programs no longer needed by the Department – such as the High-Temperature Gas Reactor program, which was terminated in FY 1994. More importantly, however, the mission of this program includes managing the Department's vital research and development facilities, such as those at Argonne National Laboratory (ANL), and to carry out long-term treatment and management of DOE's sodium-bonded spent nuclear fuel. The Department, therefore, believes that this program should be renamed the "Nuclear Facilities Management" program. Specifically, the elements of this program are as follows:

- Ensure that the Office of Nuclear Energy, Science and Technology's (NE) sites, facilities and essential nuclear R&D personnel are available to conduct priority missions for the Department and that operations are conducted in a safe, environmentally-compliant and cost effective manner.

- Maintain the physical and technical infrastructure necessary to support research and technology development by U.S. and international researchers, and continue the stewardship of special nuclear materials and other important materials needed to support current and future research missions.

- Develop the electrometallurgical treatment technology to help the Department meet long-term commitments in the management of its spent nuclear fuel.

- Prepare DOE sodium-bonded spent nuclear fuel for ultimate disposal as determined by National Environmental Policy Act (NEPA), National Research Council, and DOE review.

- Place unneeded facilities in industrially safe, stable and environmentally compliant conditions for low-cost, long-term surveillance and maintenance. The current focus in this program element is the shutdown and deactivation of the Experimental Breeder Reactor (EBR) - II at ANL-West. Key progress is being made in the treatment of sodium removed from EBR-II, which is required to fully deactivate the facility.

- Conduct innovative nuclear technology research, development, and engineering that meets the Department's long-term goals in areas such as nuclear non-proliferation, environmental restoration, and waste management.

The Termination Costs program supports the latest draft of the DOE Strategic Plan and the FY 2001 Performance Plan as follows:

Science Objective 4 – Provide the extraordinary tools, scientific workforce, and infrastructure that assure our Nation's leadership in the physical, biological, and computational sciences and in multidisciplinary research.

FY 2001 Strategy – DOE will apply its well-qualified technical staff and unique test facilities to the performance of innovative research, development, and application of nuclear energy technologies. Through this programmatic activity, the Department will resolve spent nuclear fuel disposition problems, improve nuclear technologies, and maintain nuclear power as a viable option for future United States energy supply. DOE will also develop proposals and identify funding strategies for comprehensive research and development projects that will contribute to the goal of developing new nuclear energy technologies. Through the NE Lead Laboratory designation for ANL and INEEL, the Department will strengthen its relationship with universities, and laboratories and institutions that are not specifically sponsored or managed by DOE.

Environmental Quality Objective 6 – Improve scientific understanding and develop and deploy innovative technologies that reduce cost; are more protective of workers, the public, and the environment; and resolve currently intractable problems.

FY 2001 Strategy – DOE will reduce operating costs by continuing deactivation of surplus nuclear facilities and placing them in a radiologically and industrially safe and stable shutdown condition. In support of nuclear facility deactivation, the Department will apply electrometallurgical treatment (or other technologies as determined by DOE following NEPA review) to the disposition of DOE sodium-bonded spent nuclear fuel.

Program Goal

Effectively utilize facilities and intellectual assets for development, demonstration and application of innovative nuclear technologies to meet the Department's objectives to: 1) significantly contribute to the nation's nuclear science and technology understanding and leadership; 2) maintain nuclear power as a viable future option with increased safety and reduced proliferation potential and environmental impact; and 3) responsibly deactivate and clean up unused facilities, and dispose of spent fuel and high level radioactive waste.

Program Objectives

The objectives of the program reflect long-term goals which are achievable only through multi-year funding usually extending beyond the three year period covered in this plan.

- Develop and demonstrate the viability of electrometallurgical technology for potential application in the disposal of DOE sodium-bonded and other types of spent nuclear fuel. *(Program Objective 1)*

- Prepare DOE sodium-bonded spent nuclear fuel for disposition using methods determined to be appropriate through NEPA, National Research Council, and DOE review. *(Program Objective 2)*

- Place the EBR-II and other surplus facilities at the ANL-West site near Idaho Falls, Idaho in a radiologically and industrially safe and stable shutdown condition for long-term, low-cost surveillance and maintenance. *(Program Objective 3)*

- Maintain ANL-West site safety, security, and safeguards infrastructure, upgrade physical security systems as required, and ensure that all nuclear materials are stored and handled safely in a manner which protects workers, the public, and the environment. *(Program Objective 4)*

- Meet DOE's waste management and environmental commitments to the State of Idaho. *(Program Objective 5)*

- Foster innovative research in the development of new technologies to ensure the viability of the nuclear energy option in the United States. *(Program Objective 6)*

Performance Measures

The performance measures set progress planning period goals which reflect achievements in the current year and challenging but achievable expectations for the following two years based on program funding of $78.775 million in FY 2000 and $74.0 million in FY 2001. These measures provide a means to assess the adequacy of progress in these activities.

- Complete the demonstration of the electrometallurgical spent fuel treatment technology by the end of FY 1999 using Experimental Breeder Reactor-II spent nuclear fuel. *(Performance Measure supports Program Objective 1)* [Met Goal]

- Depending upon the conclusion of the NEPA analysis currently underway, complete Fuel Conditioning Facility maintenance and resume sodium-bonded fuel treatment activities by the end of FY 2000 and treat 0.6 MTHM of EBR-II spent nuclear fuel in FY 2001. *(Performance Measure supports Program Objective 2)*

- By FY 2002, install the necessary equipment to make the Fuel Conditioning Facility and the Hot Fuel Examination Facility (HFEF) at ANL-West capable of full capacity fuel treatment (5 MTHM/year). *(Performance Measure supports Program Objective 2)*

- Complete production waste equipment process qualification and start waste form production for geologic disposal by the end of FY 2002. *(Performance Measure supports Program Objective 2)*

- Initiate draining sodium from EBR-II primary system and processing it for disposal in FY 2000. *(Performance Measure supports Program Objective 3)*

- Complete the conversion and disposition of 100 percent of the secondary sodium coolant from the Experimental Breeder Reactor-II and 40 percent of the Fermi reactor sodium coolant in storage at Argonne National Laboratory-West by the end of FY 2000. *(Performance Measure supports Program Objective 3)*

- By the end of FY 2001, complete draining the EBR-II primary system and process 100 percent of all EBR-II sodium in compliance with the Idaho National Engineering and Environmental Laboratory Site Treatment Plan. *(Performance Measure supports Program Objective 3)*

- Complete the conversion and disposition of 100 percent of the Fermi reactor sodium coolant in storage at Argonne National Laboratory-West by the end of FY 2001. *(Performance Measure supports Program Objective 3)*

- Following completion of primary sodium drain, initiate residual sodium reaction to permit final deactivation of EBR-II and all directly related facilities by March 2002. *(Performance Measure supports Program Objective 3)*

- Upgrade the intrusion detection and assessment systems for the Zero Power Physics Reactor (ZPPR) and the Fuel Manufacturing Facility (FMF) by the end of FY 2001. *(Performance Measure supports Program Objective 4)*

- In FY 2000 and FY 2001, continue to effectively maintain the scientific, engineering and technical staff as well as the facilities and equipment as necessary for the conduct of current and future DOE missions while assuring the safety of the workers and public and the protection of the environment. *(Performance Measure supports Program Objective 5)*

- In FY 2001, implement the DOE Lead Laboratory charter and develop comprehensive proposals for research and development projects that contribute to the effort to develop new nuclear energy technologies. *(Performance Measure supports Program Objective 6)*

Significant Accomplishments And Program Shifts

- Demonstration of the electrometallurgical technology for treatment of sodium-bonded EBR-II fuel and blanket assemblies was initiated in June 1996.

- EBR-II defueling was completed in December 1996.

- In FY 1997, an Environmental Assessment and Finding of No Significant Impact were issued for the shutdown of the EBR-II, including the conversion of the sodium coolant to an environmentally acceptable form suitable for disposal.

- In FY 1998, modifications to the Sodium Process Facility were completed to enable processing of legacy sodium from the Enrico Fermi Atomic Power Plant (Fermi-I) and EBR-II primary and secondary sodium into a waste form suitable for disposal.

- In FY 1999, the electrometallurgical treatment technology demonstration project was completed.

- In FY 1999, Argonne National Laboratory and Idaho National Engineering and Environmental Laboratory were designated as the Nuclear Reactor Technology Lead Laboratories for DOE-NE.

- In FY 2000, the draining and processing of the 17,000 gallons of sodium coolant from the EBR-II secondary coolant system will be completed.

- In FY 2000, complete NEPA review and issue Record of Decision on treatment of DOE sodium-bonded spent nuclear fuel.

- In FY 2000 and FY 2001, continue planning for the Remote Treatment Facility expansion of the Hot Fuel Examination Facility for disposal of ANL-W and INEEL remote-handled-mixed transuranic and alpha-mixed low-level wastes. Regulatory requirements for this facility are documented in the Site Treatment Plan (which complies with the Resource Conservation and Recovery Act and the Federal Facilities Compliance Act/Consent Order) and in the Federal court-ordered settlement agreement resolving *United States vs. Batt*, October 1995.

- In FY 2000 and FY 2001, complete processing of all stored Fermi and EBR-II secondary system sodium and continue progress toward the complete deactivation and closure of EBR-II.

Funding Profile

(dollars in thousands)

	FY 1999 Current Appropriation	FY 2000 Original Appropriation	FY 2000 Adjustments	FY 2000 Current Appropriation	FY 2001 Request
Termination Costs					
Termination Costs	84,470	80,000	-1,225	78,775	74,000
Total, Termination Costs	84,470 [a]	80,000	-1,225 [b]	78,775	74,000

Funding by Site

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Chicago Operations Office					
Argonne National Laboratory	81,143	77,254	72,800	-4,454	-5.8%
Chicago Operations Office	412	121	0	-121	-100.0%
Total, Chicago Operations Office	81,555	77,375	72,800	-4,575	-5.9%
Albuquerque Operations Office	1,500	700	0	-700	-100.0%
Washington Headquarters	1,415	0	0	0	0.0%
All Other Sites	0	700	1,200	500	71.4%
Total, Termination Costs	84,470 [a]	78,775 [b]	74,000	-4,775	-6.1%

[a] Excludes $530,000 which was transferred to the SBIR/STTR program.

[b] Includes the 0.38 percent reduction and general reduction distributed to this program.

Site Description

Argonne National Laboratory

Argonne National Laboratory (ANL) is one of the U.S. Department of Energy's largest research centers, and was the nation's first national laboratory, chartered in 1946. ANL is located at two sites. The Illinois site, ANL-East, is the main laboratory and occupies 1500 acres, surrounded by a forest preserve about 25 miles southwest of the Chicago Loop. The Idaho site, ANL-West, is located within the boundary of the Idaho National Engineering and Environmental Laboratory (INEEL) in Southeastern Idaho, about 35 miles west of Idaho Falls.

Typically, basic research is conducted at ANL-East, with large-scale testing and development conducted at ANL-West. For example, experiments, modeling, and analyses at ANL-East resulted in the development of the electrometallurgical technology that was demonstrated at ANL-West through the treatment of a limited quantity of sodium-bonded spent nuclear fuel. The capabilities of ANL-West also include nuclear fuel development, post-irradiation examinations, waste and nuclear material characterization, and development of dry, interim storage for spent fuel and other highly radioactive materials.

Activities under the Termination Costs program use a number of significant facilities at ANL-West, including the Hot Fuel Examination Facility (HFEF), Fuel Conditioning Facility (FCF), Fuel Manufacturing Facility (FMF), Sodium Process Facility (SPF), Analytical Laboratory (AL), Electron Microscopy Laboratory (EML), and Radioactive Scrap and Waste Facility (RSWF).

The HFEF is a versatile, modern hot cell facility that is operated to characterize and package spent fuel and radioactive waste, including high-level waste, which could ultimately be placed in a geologic repository. The FCF is being used to demonstrate the treatment of sodium-bonded spent nuclear fuel from the Experimental Breeder Reactor-II (EBR-II) using electrometallurgical treatment technology. (The EBR-II is a research reactor at ANL-West that has been defueled and is being deactivated.) The FMF is currently being used to develop and test fuel for research reactors, and to verify suitability of waste forms that would result from electrometallurgical treatment. The SPF is being used to convert radioactive sodium into a chemically stable, low-level waste form. The sodium being converted includes legacy sodium from the Enrico Fermi Atomic Power Plant (Fermi-I) in Michigan, which is stored at ANL-West, and the primary and secondary sodium coolant from the EBR-II. The AL and the EML provide analytical capabilities in support of electrometallurgical treatment technology and the development of waste forms for the resulting high level waste that will be suitable for long-term geologic disposal. The RSWF provides a fully permitted interim storage capability for a variety of experimental spent fuels and radioactive scrap. Other facilities at ANL-West, such as the Zero Power Physics Reactor and the TREAT, while not currently operating, provide a number of reactor physics, core design, nuclear materials, and waste treatment testing capabilities.

In July 1999, the Department selected the ANL and the INEEL to serve as the Nuclear Reactor Technology Lead Laboratories. These Lead Laboratories will assist and work with the Department's

Office of Nuclear Energy, Science and Technology to maintain and apply world class technical capabilities to assure that the Department is maximizing its investment in nuclear reactor technology research and development. This effort will focus principally on research and development activities that addresses long-term nuclear reactor technology issues such as reducing the cost of nuclear-generated electricity, finding better ways to deal with spent fuel and proliferation issues, improving the performance of existing plants, and achieving even higher levels of safety than has been achieved thus far.

Termination Costs

Mission Supporting Goals and Objectives

The Termination Costs program is an important component of the Department's energy supply and research missions, encompassing several major areas. Key areas include managing and maintaining several of the Department's vital research and development facilities; developing technology to support the Department's long-term commitments in the management of spent nuclear fuels; treating and managing DOE sodium-bonded spent nuclear fuel in accordance with NEPA, National Research Council panel, and DOE reviews; conducting innovative nuclear technology research and development; and deactivating unneeded facilities.

In addition to deactivation activities, the Termination Costs program includes activities formerly funded under the Nuclear Technology R&D Program. These activities support the Department's mission to manage approximately 2,700 metric tons of spent nuclear fuel currently in its inventory. These activities could reduce life-cycle costs by developing and deploying an innovative spent fuel treatment technology to solve currently intractable problems. The Department continues to work with Argonne Laboratory to reduce annual program costs and, where appropriate, program staff. Efforts in this area are important to the Department's strategic environmental quality goal to aggressively address the legacy of civilian nuclear research and development programs, minimize waste volumes, safely manage nuclear materials, and permanently dispose of the Department's radioactive wastes.

The challenge of effectively managing the large inventory of DOE spent nuclear fuel is greatly complicated by the fact that it consists of about 150 different fuel types. Some of these spent fuels present special problems, (*e.g.*, the presence of hazardous materials such as sodium). Other spent fuels are damaged, such as the core debris from Three Mile Island unit 2. Spent fuel with these characteristics may not be acceptable for disposal in current form in a geologic repository and therefore must be treated. A prime example of this type of challenge is the EBR-II spent fuel at the ANL-West site. The EBR-II spent fuel is a metal fuel form containing elemental sodium as a bonding agent. Sodium metal is highly reactive, and it burns in air, and can explode when exposed to water. Because the sodium is partially absorbed by the uranium fuel elements, mechanical means are not fully effective in removing the sodium. Therefore, the Department is analyzing whether or not to treat this fuel to remove as much of the sodium as possible to create a waste form acceptable for disposal. A candidate technology for removing the sodium from sodium-bonded spent fuel is the electrometallurgical treatment technology developed by ANL. In FY 1996, the Department completed an environmental assessment for the demonstration of electrometallurgical technology to treat EBR-II fuel and blanket assemblies. This ANL-West demonstration project, limited to 125 EBR-II driver and blanket assemblies, was completed in FY 1999. Progress to date has been very encouraging and an environmental impact statement is being prepared for disposition of sodium-bonded fuel with application of this technology as an action alternative.

Under the former Nuclear Technology R&D program, ANL-East conducted electrometallurgical treatment R&D to support the timely completion and accurate assessment of the EBR-II spent fuel treatment demonstration project at ANL-West. In addition to direct analytical support to demonstration operations, limited R&D efforts were directed at increasing the understanding and managing the

remaining technical challenges of applying the electrometallurgical technology to spent nuclear fuel. Waste form fabrication and performance results from the demonstration project will be used by the Department in evaluating this technology for application to other DOE-owned spent fuel. The electrometallurgical treatment technology is not being developed for application to commercial spent nuclear fuel.

A National Research Council (NRC) panel has been providing an ongoing independent evaluation of the development of electrometallurgical technology and the demonstration project. Based on their reviews, the panel supported completion of the electrometallurgical technology demonstration project and the subsequent analysis of the laboratory results. The NRC is currently scheduled to issue a final report on the electrometallurgical demonstration project in early 2000. The NRC review is crucial to the Department's assessment of the demonstration project and any decision to proceed with further application of electrometallurgical technology to the remaining inventory of sodium-bonded spent nuclear fuel.

The FY 2001 budget requests funding to continue development and testing of waste stream treatment process equipment of a scale suitable for spent fuel inventory treatment, continue long-term tests to characterize performance of reference waste forms in accordance with established testing protocol, and develop waste form qualification plans and computer modeling to gain Nuclear Regulatory Commission approval for disposal of metal and ceramic waste forms in a geologic repository.

The Department's path forward for managing its inventory of sodium-bonded nuclear fuel will be based, in part, on the results from the NRC review, as well as the completion of a NEPA review. Thus, the FY 2001 budget request provides funding for the disposition of DOE's remaining inventory of sodium-bonded spent nuclear fuel.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
ANL-West Infrastructure	37,000	36,675	39,150	2,475	6.7%
Facility Termination Activities	47,470	30,400	25,000	-5,400	-17.8%
Technology Activities	0	11,700	9,850	-1,850	-15.8%
SBIR	0 [a]	0	0	0	0.0%
Total, Termination Costs	84,470 [a]	78,775 [b]	74,000	-4,775	-6.1%

[a] Excludes $530,000 which was transferred to the SBIR/STTR program.

[b] Includes the 0.38 percent reduction and general reduction distributed to this program.

Detailed Program Justification

(dollars in thousands)

	FY 1999	FY 2000	FY 2001
ANL-West Operations Infrastructure: The infrastructure components, as described below, are required to satisfy safety, security and environmental requirements; maintain facilities in a user ready status with a capable, knowledgeable well trained core staff; and provide support functions for the ongoing program work			
# **Nuclear facility support:** Engineering, technical, operator and technician support for maintaining the nuclear facilities at ANL-W in compliance with DOE Orders, environmental and industrial safety requirements and good management practice. Includes maintenance and calibration of radiation protection, detection and control systems; maintenance of HVAC, filtration, emergency power, breathing air, instrument air and materials handling systems; calibration of facility instrumentation and control equipment; radiation monitoring; safety oversight; safety analysis; waste management; procedures; and training.	12,500	12,000	12,300
# **Radiological facility support:** Engineering, technical, operator and technician support for maintaining the radiological facilities at ANL-W in compliance with DOE Orders, environmental and industrial safety requirements and good management practice. Includes maintenance and calibration of radiation protection, detection and control systems; maintenance of HVAC, filtration, emergency power, breathing air, instrument air and materials handling systems; calibration of facility instrumentation and control equipment; radiation monitoring; safety oversight; safety analysis; waste management; procedures; and training.	8,000	7,925	8,100
# **Balance-of-plant support:** Maintenance of non-nuclear and non-radiological facilities; utilities; roads; fences; grounds; electrical distribution, sanitary and wastewater systems; steam production and distribution, fire detection and protection, and life safety communications systems to ensure safe operations, environmental compliance, and protection of Government investment.	4,000	3,950	4,050

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
# **Site management and administration:** Management, reporting, planning, budgeting, resource allocation, human resources, procurement, accounting, subcontract administration materials handling and warehousing. In FY 2000 and FY 2001 this also includes some ANL personnel severance costs. To the extent that severance costs can be avoided through work for others, these savings will be applied to disposition of spent fuel to expedite progress and lower life cycle costs.	3,500	3,775	4,500
# **INEEL support services:** Electricity and power management, telecommunications, dosimetry, solid waste management, fire department, emergency management, transportation, and occupational medicine.	4,500	3,900	4,000
# **Security and Safeguards**: Physical security of nuclear materials and classified information, investigations for obtaining and maintaining security clearances, management, control and accountability of nuclear materials.	4,500	5,125	5,200
# **General Plant Project (GPP) funding**: Replacement of detection systems is necessary to avoid reduction in the current level of protection. This GPP will upgrade the intrusion detection and assessment systems for the Zero Power Physics Reactor and the Fuel Manufacturing Facility protected area with more reliable current technology equipment.	0	0	1,000
Total, ANL-West Operations Infrastructure.	37,000	36,675 [a]	39,150
Facility Termination Activities: These are the costs to conduct NE programs according to the stated program objectives and performance measures			
# **Electrometallurgical treatment demonstration project:** Using the Fuel Conditioning Facility, the Hot Fuel Examination Facility, and other support facilities as needed at the Argonne National Laboratory West and East sites, demonstrate the electrometallurgical treatment technique on up to 1.6 metric tons (uranium) of sodium-bonded spent nuclear fuel removed from the EBR-II to help the Department reach a decision on the treatment and management of its full inventory of 60 metric tons (uranium) of sodium-bonded spent nuclear fuel.	25,000	0	0

[a] Includes the 0.38 percent reduction and general reduction distributed to this program.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
# **Technical support:** Scientific and engineering support including laboratory testing and prototype equipment development and operation for the electrometallurgical treatment demonstration project.	14,470	0	0
# **Sodium Processing:** Includes processing of EBR-II secondary and Fermi sodium and preparation for processing EBR-II primary sodium in the planning period.	5,300	5,000	3,000
# **Deactivation:** Includes engineering and technical effort for the deactivation of the EBR-II and directly related facilities.	2,700	6,350	5,800
# **Disposition DOE sodium-bonded spent nuclear fuel**: Operate Argonne facilities in accordance with EIS Record of Decision (ROD) for disposal of stored sodium-bonded fuels. In FY 2000, this activity includes maintaining FCF, HFEF and core staff to allow for management of the DOE inventory of sodium-bonded spent fuel in accordance with the DOE ROD following completion of the NEPA review process. In FY 2001 this includes completing deferred facility and process equipment maintenance and improvements, but does not fund 24 hour operation. Consequently, the FY 2001 production rate is anticipated to be only about 50% of the goal of 5 MTHM/year, or about 0.6 MTHM in 3 months.	0	18,350	15,000
# **Dispose of Legacy Materials:** Repackage and remove DOE legacy spent fuel from a commercial facility.	0	700	1,200
Total, Facility Termination Activities	47,470[a]	30,400	25,000

[a] Excludes $530,000 which was transferred to the SBIR/STTR program.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Technology Activities:			
# **Fuel and Waste Disposition Technology Activities:** Provide technical support for sodium-bonded spent nuclear fuel treatment by developing and testing waste stream treatment process equipment of a scale suitable for inventory treatment. Also conduct long-term tests to characterize performance of reference waste forms and gain Nuclear Regulatory Commission approval for emplacement of metal and ceramic waste forms in a geologic repository. Perform R&D as directed on potential application of this technology for disposition of other DOE fuels. Note: The reduction in FY 2001 represents a split of the funding between support for the production operations (see technical support above) and the R&D activities which are essential for final disposition of the process products.	0	11,700	9,850
Small Business Innovative Research and Small Business Technology Transfer Programs			
# Small Business Innovative Research and Small Business Technology Transfer Programs.	0	0	0
Total, Termination Costs	84,470 [a]	78,775 [a]	74,000

[a] Includes the 0.38 percent reduction and general reduction distributed to this program.

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
ANL-West Infrastructure	
# The increase in infrastructure costs reflects increases in facility support, management services and security and safeguards costs.	1,475
# A new security system line item is included to upgrade the intrusion detection and assessment systems for the ZPPR and FMF protection area.	1,000
Facility Termination Activities	
# This decrease for facility termination costs reflects decreases principally in sodium processing and disposition of DOE sodium-bonded spent nuclear fuel activities. Sodium processing activities are to be resumed in April 2000, with completion scheduled for late FY 2001. Also, costs for disposition of DOE sodium-bonded spent nuclear fuel activities in accordance with the EIS Record of Decision, will decrease in FY 2001 due to additional expenditures in FY 2000 for equipment upgrades and facility startup activities as the FCF and HFEF are placed into limited production service.	-5,400
Technology Activities	
# This decrease in the technology activities reflects primarily the additional funding needed to initiate long-term tests in FY 2000 to characterize performance of reference waste forms as compared to associated FY 2000 technology activities.	-1,850
Total Funding Change, Termination Costs	-4,775

Capital Operating Expenses & Construction Summary
Capital Operating Expenses

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
General Plant Projects	0	0	1,000	1,000	100.0%
Total, Capital Operating Expenses	0	0	1,000	1,000	100.0%

Fast Flux Test Facility

Program Mission

The Fast Flux Test Facility (FFTF) program provides for the safe and cost-effective maintenance of the FFTF. The FFTF is the Department's only facility capable of producing steady-state, high-energy, high-fluence neutrons to support nuclear research and isotope production missions. Because the FFTF, unique among other available test reactors and accelerators, can produce "fast" neutrons in great quantity, there is a suite of viable missions for which sponsors have identified clear needs. These missions include nuclear research, materials testing, and isotope production.

Secretary Richardson announced on August 18, 1999, that the Department would conduct a National Environmental Policy Act (NEPA) review that will include a complete analysis of the environmental impacts associated with the restart and operation of the FFTF, the next step in determining the future of the reactor. This decision came after the Department's Nuclear Energy Research Advisory Committee (NERAC), an external independent advisory panel, reviewed the Scoping Plan for the FFTF, and voted 19-2 to recommend that the Secretary proceed toward a Record of Decision (ROD) on the FFTF.

The Department is preparing a Programmatic Environmental Impact Statement (PEIS) which will evaluate options for managing the Department's nuclear research infrastructure to meet projected national research and development needs. These needs include a reliable supply of isotopes and irradiation services for medicine, industry, research and space exploration. DOE's nuclear facility infrastructure is diminishing while the demand for steady-state neutron sources continues to increase. Presently, DOE does not have sufficient neutron sources to meet its projected irradiation needs for medical isotope production, plutonium-238 production for future space exploration missions, and nuclear research and development. To address this neutron source deficiency, the PEIS will evaluate a range of options including the use of existing operating facilities, the re-start and operation of the FFTF, and the construction of entirely new facilities. The options to be analyzed also include making no changes to the Department's existing facilities and permanently deactivating the FFTF. No preferred alternative will be identified in the draft PEIS.

The PEIS, scheduled for completion early in FY 2001, will be supported by a comprehensive technical research and development plan developed under the oversight of NERAC and nonproliferation and cost analyses. A Secretarial Record of Decision (ROD), which will be informed by the results from the PEIS, nonproliferation and cost analyses, and NERAC reviews, will subsequently be issued in the second quarter of FY 2001.

The FFTF is being maintained in standby with the reactor completely defueled while the Department completes the NEPA review. The main heat transport system is being operated at approximately 400°F. Essential systems, staffing, and support services are being maintained at levels that would allow for cost effective restart, as well as economic deactivation of the facility. Those activities which support either restart or deactivation options would initiate prior to the ROD where practicable. If it is decided to deactivate the FFTF, lessons learned from other deactivation projects will be applied as appropriate. In particular, the sodium handling and treatment experience gained in permanently shutting down the

Experimental Breeder Reactor-II at Argonne National Laboratory - West would be applied to the sodium-draining operations required for FFTF deactivation.

The Fast Flux Test Facility program supports the DOE Strategic Plan and the FY 2001 Performance Plan as follows:

Corporate Management Objective 1 - Ensure the safety and health of the DOE workforce and members of the public, and the protection of the environment in all Departmental activities.

Science Objective 4 - Fuel the future with science for clean and affordable energy.

  < FY 2001 Strategy - The Department will ensure that essential systems, staffing, and support services are maintained at the necessary levels to keep the facility in compliance with federal and state safety and environmental requirements and allow implementation of the Record of Decision expected in FY 2001.

Program Goal

The goal of the FFTF program is to complete the NEPA review of the potential environmental impacts associated with returning the facility to operation as a nuclear research and isotope production facility. The Record of Decision, expected in the second quarter of FY 2001, will be informed by the results of the NEPA review, a long-term nuclear energy research and development plan, a cost analysis, a nonproliferation policy study, and other considerations. If the Department decides the FFTF is needed as part of the nation's nuclear facility infrastructure to support critical research enterprises, a facility restart project will be initiated in FY 2001. If the Department decides the FFTF is not needed, the facility will be permanently deactivated.

Program Objective

To maintain the FFTF in a safe, environmentally-compliant condition to allow implementation of the Secretarial decision resulting from the NEPA review and Record of Decision which could be to restart the facility as a nuclear research and medical isotope production facility or permanently shut down the facility.

Performance Measures

In FY 1999, maintain the FFTF in a safe, environmentally-compliant standby condition. [Met Goal]

In FY 2000, maintain the FFTF in a safe, environmentally-compliant standby condition while implementing a Secretarial decision to conduct a National Environmental Policy Act review of the environmental impacts of returning the facility to operation.

In FY 2001, complete the National Environmental Policy Act review of the environmental impacts of returning the facility to operation and issue a Record of Decision.

If the December 2000 Record of Decision leads to the initiation of a FFTF restart project, initiate conceptual design activities for system restoration and required upgrades.

If the December 2000 Record of Decision leads to the permanent shutdown of the FFTF, complete the procurement of additional interim spent fuel storage casks and drain the sodium coolant from the reactor vessel and primary heat transport system.

Significant Accomplishments and Program Shifts

In FY 1997, a Secretarial decision was made to maintain the FFTF in standby condition and to evaluate the tritium and medical isotope production capabilities of the facility.

In December 1998, a Secretarial decision was made to not use the FFTF for tritium production and to further evaluate the potential use of the facility as a multi-mission nuclear research facility.

In May 1999, a Secretarial decision was made to prepare a Program Scoping Plan to clearly define the potential uses of the FFTF, the roles and responsibilities of potential user communities, and opportunities for private-public partnerships. The objective of the program scoping plan was to establish whether a compelling rationale exists for DOE to further consider the potential restart of FFTF.

In August 1999, following the completion of the Program Scoping Plan and a review by the Department's Nuclear Energy Research Advisory Committee, a Secretarial decision was made to initiate a NEPA review of the environmental impacts associated with the restart and operation of FFTF as a nuclear research and medical isotope production user facility.

Funding Profile

(dollars in thousands)

	FY 1999 Current Appropriation	FY 2000 Original Appropriation	FY 2000 Adjustments	FY 2000 Current Appropriation	FY 2001 Request
Fast Flux Test Facility (FFTF)					
Fast Flux Test Facility (FFTF)	30,000 [a]	28,000 [b]	0	28,000	44,010
Total, Fast Flux Test Facility Program . .	30,000 [a]	28,000 [b]	0	28,000	44,010

Funding by Site

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Richland Operations Office					
Fluor Daniel Hanford	30,000 [a]	28,000 [b]	44,010	16,010	57.2%
Total, Fast Flux Test Facility	30,000 [a]	28,000 [b]	44,010	16,010	57.2%

[a] Excludes $9.2 million of prior year balances reprogrammed into this account in FY 1998.

[b] Excludes $11.7 million proposed reprogramming to maintain the facility in full compliance with applicable Federal and State health, safety and environmental regulations, to retain most of the facility's cost-effective preventative maintenance program; and to conduct a National Environmental Policy Act review to evaluate the Department's nuclear infrastructure, including FFTF restart and operation.

Site Description

Hanford Site

The FFTF, located at the Department's Hanford Site, near Richland, Washington, is a U.S. Government-owned 400 megawatt-thermal sodium-cooled, fast-neutron flux reactor originally intended for irradiation testing of nuclear reactor fuels and materials for the U.S. liquid metal reactor (LMR) program. The FFTF is the largest and most modern facility of its kind in the world.

The design, operation, and maintenance of FFTF was conducted in accordance with the standards established by the Office of Reactor Development and Technology (RDT) and the American National Standards Institute (ANSI), and the codes established by the American Society of Mechanical Engineers (ASME). An independent safety review of the design and construction of FFTF was conducted by the U.S. Nuclear Regulatory Commission (NRC) at the request of the Energy Research and Development Administration. The objective of the safety review was "to provide an in-depth technical review of the design of the FFTF comparable to that of a licensed plant." The NRC safety review was directed at "evaluating the adequacy of the design to ensure safe operation of the plant" and resulted in the issuance of a Safety Evaluation Report in August 1978.

The FFTF is an array of buildings and equipment arranged around a reactor containment building. The reactor vessel is located in a shielded cell in the center of the containment. Heat is removed from the reactor vessel by liquid sodium circulated through three primary loops (including primary pumps, piping and intermediate heat exchangers) also located in cells in containment. Secondary sodium coolant loops transport the reactor heat from the intermediate heat exchangers to the air-cooled tubes of the dump heat exchangers.

The FFTF includes facilities for receiving, conditioning, storing, installing and removing from the core all routinely replaced core components, and storing irradiated fuel. Post-irradiation examination and packaging capabilities are also available. Utilities and services at FFTF include onsite emergency generation of electrical power, heating and ventilation, radiation monitoring, fire protection, auxiliary cooling systems for cell atmospheres and some components.

The FFTF is in standby with the reactor completely defueled. The main heat transport system is being operated at approximately 400°F. Essential systems, staffing, and support services are being maintained. Standby surveillance and maintenance activities are being performed to ensure that there is: (1) no degradation of key plant systems; (2) retention of the authorization basis and configuration control; (3) maintenance of key staffing, qualifications, and training; and (4) compliance with Federal and state safety and environmental requirements.

The FFTF was operated from April 1982 to April 1992 in support of various Department programs such as material testing for fusion, space reactor, and international fast reactor programs. The facility played a key role in Liquid Metal Reactor (LMR) development and testing activities as it provided a test bed for demonstrating and evaluating the performance of fuel assembly and core designs in a prototypic LMR

environment. The FFTF is widely considered the Department's best nuclear facility in terms of conduct of operations.

The FFTF has been in a hot-standby condition since December 1993. In November 1995, the Department decided to limit deactivation work at FFTF to those activities which would not prohibit the facility from being returned to service in order to study the facility's capability for tritium and medical isotope production. In January 1997, the Department decided to continue to maintain the facility in standby to further evaluate the tritium and medical isotope production capabilities of the facility and to determine what role, if any, the facility could play in the Department's tritium production strategy.

In December 1998, the Secretary announced the decision to remove the FFTF from consideration as a tritium supply source but to further investigate the facility's potential role in the Department's national nuclear technology infrastructure. In May 1999, after careful consideration of the recommendations from the Nuclear Energy Research Advisory Committee (NERAC) and other analyses, the Secretary concluded that the facility could possibly serve a unique and valuable science and research role. As such, the Secretary asked that a program plan be developed that clearly defines the potential application of the facility and the roles and responsibilities of potential user communities.

In July 1999, following a review of the program scoping plan, NERAC voted 19 to 2, in favor of a resolution recommending the Department proceed toward a Record of Decision on FFTF. NERAC further recommended that a non-proliferation policy review, cost evaluation, and mission assessment be conducted to inform the Record of Decision. NERAC also recommended that, in moving to the Record of Decision, NE prepare a long-range plan for its research and development activities and that FFTF be included in this plan.

Based on the results from the program scoping plan and the NERAC recommendations, the Secretary announced on August 18, 1999, that the Department would initiate a NEPA review of the environmental impacts associated with the restart and operation of FFTF as a nuclear research and medical isotope production facility. The results from the NEPA review would inform a Record of Decision which could result in the establishment of a FFTF restart project or deactivation project.

Fast Flux Test Facility

Mission Supporting Goals and Objectives

The FFTF is the Department's only steady-state source for high-energy, high-fluence neutrons to support nuclear research and medical isotope production missions.

The FFTF program supports the Department's strategic missions of energy resources and science and technology. The FY 2001 budget request reflects the minimum level of activity and cost necessary to maintain the facility in a safe and environmentally-compliant condition to allow implementation of the Secretarial decision resulting from the NEPA review and Record of Decision which could be to restart the facility as a nuclear research and medical isotope production facility or permanently shut down the facility. The initial activities to implement the Secretarial decision to either return FFTF to operation or permanently shut it down will be performed at this funding level.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Fast Flux Test Facility (FFTF)	30,000 [a]	28,000 [b]	44,010	16,010	57.2%
Total, Fast Flux Test Facility	30,000 [a]	28,000 [b]	44,010	16,010	57.2%

[a] Excludes $9.2 million of prior year balances reprogrammed into this account in FY 1998.

[b] Excludes $11.7 million proposed reprogramming to maintain the facility in full compliance with applicable Federal and State health, safety and environmental regulations, to retain most of the facility's cost-effective preventative maintenance program; and to conduct an National Environmental Policy Act review to evaluate the Department's nuclear infrastructure, including FFTF restart and operation.

Detailed Program Justification

(dollars in thousands)

	FY 1999	FY 2000	FY 2001
Maintain Fast Flux Test Facility			
# Conduct minimum surveillance and maintenance activities to maintain the facility in full compliance with applicable Federal and State health, safety and environmental regulations. These activities continue throughout the entire fiscal year, before and after the expected Secretarial decision on the future of the facility. Seventy-seven of the 96 plant systems remain operational to keep the 260,000 gallons of sodium coolant in a hot, molten condition. Additionally, irradiated and unirradiated plutonium-uranium oxide fuel stored at the facility must be monitored and maintained. The surveillance and maintenance activities are the minimum facility activities necessary to meet the contractually-mandated health, safety and environmental requirements in the FFTF Standards/Requirements Identification Document (S/RID). The S/RID is based on applicable DOE orders, statutory regulations, industry standards and codes, guidance documents, and best industry practices. Maintaining the facility in this "minimum safe" condition requires a staff of 197 properly qualified personnel. FY 2001 estimated cost breakdown: labor ($23.390 million); electricity, inert gases and fuel oil ($2.100 million); consumables, materials and other contracts and services ($3.373 million); safeguards and security ($4.525 million); and contractor fee ($1.700 million).	30,000 [a]	28,000 [b]	35,088

[a] Excludes $9.2 million of prior year balances reprogrammed into this account in FY 1998.

[b] Excludes $11.7 million proposed reprogramming to maintain the facility in full compliance with applicable Federal and State health, safety and environmental regulations, to retain most of the facility's cost-effective preventive maintenance program; and to conduct a National Environmental Policy Act review to evaluate the Department's nuclear infrastructure, including FFTF restart and operation.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Conduct Activities Required for Either FFTF Restart or Deactivation [Assumes ROD Issued in 2nd Quarter of FY 2001]			
# Perform preventive and corrective maintenance and control upgrades on fuel handling systems to enhance reliability, which will be required for either restart or deactivation. These activities will continue throughout entire fiscal year, prior to and after the ROD.	0	0	3,242
# Expand surveillance and maintenance activities for operating equipment needed to support either restart or deactivation beyond minimum activities, including a resumption of the facility's preventive and corrective maintenance program. These activities continue until the ROD, after which facility activities specific to the decision will start.	0	0	1,495
# Perform maintenance on non-operating, major plant components needed to support either restart or deactivation, to ensure their availability. This maintenance will continue until the ROD, after which maintenance specific to the decision will start..	0	0	1,000
# Support preparation of NEPA documentation and environmental permits.	0	0	149
# Implement the Secretarial Decision to Restart or Shutdown [Assumes ROD Issued in 2nd Quarter of FY 2001].	0	0	3,036
< Assuming Restart			
S Further expand surveillance and maintenance activities for operating equipment required for restart beyond minimum activities, including a resumption of the facility's preventive and corrective maintenance program - ($1,496)			
S Expand maintenance to remaining non-operating, major plant components needed for restart, to ensure equipment availability - ($1,000)			
S Conduct planning for system restoration and conceptual design of upgrades to equipment - ($240)			
S Conduct/prepare/initiate conceptual design of isotope production systems - ($300)			

(dollars in thousands)

	FY 1999	FY 2000	FY 2001
OR			
< Assuming Deactivation			
S Initiate preparations to drain sodium coolant from reactor vessel and heat transport system - ($500)			
S Procure custom-designed and fabricated pump for drain of reactor vessel - ($350)			
S Hire, train and qualify staff to support fuel off-load and sodium drain - ($2,186)			
Total, Fast Flux Test Facility	30,000 [a]	28,000 [b]	44,010

[a] Excludes $9.2 million of prior year balances reprogrammed into this account in FY 1998.

[b] Excludes $11.7 million proposed reprogramming to maintain the facility in full compliance with applicable Federal and State health, safety and environmental regulations, to retain most of the facility's cost-effective preventive maintenance program; and to conduct a National Environmental Policy Act review to evaluate the Department's nuclear infrastructure, including FFTF restart and operation.

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
Maintain Fast Flux Test Facility	
# Funding change reflects shortfall in budget request and appropriated funding for FY 2000. The Department is proposing a FY 2000 reprogramming request of $11.7 million to maintain the facility in full compliance with applicable Federal and State health, safety and environmental regulations, to retain most of the facility's cost-effective preventive maintenance program ($7.7 million); and to conduct a National Environmental Policy Act review to evaluate the Department's nuclear infrastructure, including FFTF restart and operation ($4.0 million).	7,088
Conduct Activities Required for Either FFTF Restart or Deactivation [Assumes ROD Issued in 2nd Quarter of FY 2001]	
# Funding change reflects additional funding required for activities to support implementation of the Secretarial decision on the status of the facility. These activities include :	
S FFTF Restart and Deactivation: Control upgrades for fuel handling systems, expanded equipment surveillance and maintenance, and support for PEIS and ROD development ($5,886), and	
S FFTF Restart: Further expansion of equipment surveillance and maintenance, planning for system restoration, conceptual design for equipment upgrades, and conceptual design development of isotope production systems ($3,036)	
OR	
S FFTF Deactivation: Preparations to drain FFTF sodium coolant, procurement of reactor vessel drain pump, and hiring, training and qualification of staff needed to support fuel off-load and sodium drain ($3,036)	8,922
Total Funding Change, Fast Flux Text Facility	16,010

Isotope Production and Distribution Program Fund

Program Mission

The mission of the Isotope Program is to serve the national need for a reliable supply of isotope products, services and related technology used in medicine, industry, and research. The Isotope Program operates under an Isotope Production and Distribution Fund, which is a revolving fund. All program sales transactions and costs are financed by revenues from sales of isotopes products and services and through payments from the Isotope Support decision unit in Energy Supply. The Fund's revenue and expenses are audited annually consistent with Government Auditing Standards and other relative acts, such as the Chief Financial Officers Act of 1990 and the Government Performance and Results Act of 1993. Included in the Annual Financial Statements and Program Overview are the performance measures results.

The Department has supplied isotopes and related services to the public for more than 50 years. As the range of available isotopes and recognized uses has grown, isotope applications have become vital to continued progress in medical research and practice, new industrial processes, diagnosis, and therapies, which are an indispensable and growing component of the U.S. health care system. The use of medical isotopes reduces health care costs and improves the quality of patient care.

It is estimated that one in every three people treated at a hospital makes use of a radioisotope in their laboratory tests, diagnoses, or therapy. Each day, over 40,000 patients benefit from medical imaging technologies. In 1998, over 13 million nuclear medicine procedures were performed in more than 4,000 nuclear medicine facilities in the United States. Therefore, an adequate supply of medical and research isotopes is essential to the Nation's health care system, and to basic research and industrial applications that contribute to national economic competitiveness. The Department supports nuclear medicine research through direct financial assistance and by providing isotopes to researchers at reduced prices.

Currently, the Department develops, produces, sells and leases hundreds of types and forms of stable and radioactive isotopes for commercial, medical, and research applications throughout the United States and to approximately 25 foreign countries. Isotopes are sold by the Department only when there is no U.S. private sector capability or when other sources do not have sufficient capacity to meet U.S. needs. The Department encourages private sector investment by offering to sell or lease existing facilities, equipment, and material for commercial purposes or through the licensing of new patent technologies.

Program Goals

Program goals for the Isotope Production and Distribution Fund are discussed in the Isotope Support section.

Program Objectives

Program objectives for the Isotope Production and Distribution Fund are discussed in the Isotope Support section.

Performance Measures

Performance measures for the Isotope Production and Distribution Fund are discussed in the Isotope Support section.

Funding Profile

No funds are requested for the Isotope Production and Distribution Fund. The budgetary resources for the Fund are received as spending authority from offsetting collections from two sources: (1) expenditure transfers of all appropriated funds from Energy Supply-Isotope Support; and (2) revenues from the sales of goods and services to the public. See the Isotope Support section for justification of the $17.215 million appropriations request. Sales in FY 1999 were $9.0 million, and the projected sales for FY 2000 and FY 2001 are $10 million and $8.0 million, respectively. The FY 2001 combined budget request and projected revenue should provide the Fund sufficient cash to meet total estimated program expenses of $25,215,000, a reduction of $5,240,000 from FY 2000.

Revenues will decrease in FY 2001, in part because of the very successful commercialization of the production of revenue-producing isotopes such as yttrium-90 and iridium-192. Cost savings have accrued to the program by reducing the funding needed at Pacific Northwest National Laboratory and Idaho National Engineering and Environmental Laboratory. However, funding required at the remaining facilities, which provide isotopes needed by U. S. scientists in fields ranging from cancer research to understand how the ecosystem retains carbon dioxide, has not decreased. This requires appropriations to pick up additional costs for research isotope production or, without this increased funding, the national infrastructure will continue to erode and eventually collapse.

Isotope Support

Program Mission

The mission of the Office of Nuclear Energy, Science and Technology's (NE), Office of Isotope Programs (Isotope Programs) is to serve the national need for a reliable supply of isotope products, services, and related technology used in medicine, industry, and research. Isotope Programs supports development of new or improved isotope products and services that are used in medical diagnoses and therapy and other applications that are in the national interest. As a new area of concentration, the Advanced Nuclear Medicine Initiative (ANMI) was implemented in fiscal year 2000. ANMI will support peer-reviewed research to advance nuclear medicine technology in the United States. The Department encourages private sector investment by offering to sell or lease existing facilities, equipment, and material for commercial purposes or through the licensing of new patent technologies. Over the last several years, the program has emphasized the privatization of commercially-viable isotope activities while making investments in the production of isotopes which are vital to the research community in the United States. An example of such investment is the Isotope Production Facility, a new production capability at the Los Alamos Neutron Science Center that will enable year-round production of accelerator isotopes.

As the range of available isotopes and the recognized uses for them have increased, new or improved isotope products have become essential for progress in medical research and practice, new industrial processes, and scientific methodology. Also, a substantial national and international infrastructure has been built around the use of isotopes. For example, thallium-201 is used for medical cardiac imaging and calcium-44 is used in bone growth studies. Iridium-192 is used for nondestructive testing of construction and other materials and americium-241 is used in smoke detectors.

A recent expert panel report entitled "Forecast Future Demand for Medical Isotopes," prepared for and endorsed by the Nuclear Energy Research Advisory Committee (NERAC) in March, projects a significant annual demand growth for isotopes produced by the Isotope Programs and encourages a more extensive collaborative effort between the Isotope Programs and the National Institutes of Health in the areas of basic medical isotope research. The study, prepared by a panel of recognized experts in the medical isotope community, concludes that the Department must continue to develop the capability to produce a diverse supply of radioisotopes for medical use in quantities sufficient to support research and clinical activities. This would prevent shortages of isotopes, reduce American dependence on foreign radionuclide sources, and stimulate biomedical research. The expert panel projects that the expected growth rate of these medical isotopes over the next 20 years will be between 7-14 percent annually for therapeutic or treatment applications and 7-16 percent annually for diagnostic applications. The panel noted that these growth rates are attainable only if basic research in nuclear medicine is supported and modern, reliable isotope production facilities are available. If the conditions are not supported, the practice of nuclear medicine will suffer, as will the patients who require these services.

According to the panel, nuclear medicine is being crippled by the deteriorating infrastructure for isotope production, chiefly due to aging facilities and high maintenance costs. Research isotopes for promising new nuclear medicine products are frequently unavailable or very expensive. Clinical trials, which are the kernels of promising and exciting new therapies, often need large quantities of radionuclides that are

not always readily available. This could lead to the abandonment of research, or at least significant delays in clinical trials. The report states these issues need to be addressed by the Department in order to make a significant investment in isotope production capabilities over the next ten years.

The isotope program has been minimally funded for several years and the infrastructure has suffered from postponement of maintenance and upgrading. In addition, capital investment in new or replacement processing equipment to improve production and processing of isotopes has also been deferred due to insufficient funding. Needed equipment upgrades and maintenance, which would decrease the radiation exposure of workers due to shorter processing times, and more modern equipment which would be inherently safer, have not been added to our laboratory facilities. Deferment of maintenance and purchase of more modern capital equipment also increases production cost and affects the Isotope Programs' ability to supply isotopes reliably.

The isotope program, which operates under a revolving fund as established by the FY 1990 Energy and Water Appropriations Act (Public Law 101-101), maintains its financial viability by utilizing Congressional appropriations and revenues from the sale of isotopes and services. It is important to note that unlike most Federal programs, the isotope program operates with a revolving fund and operates like a business. Unobligated/uncosted balances that include customer advances and revenues generated by isotope sales serve as "working capital" and will increase or decrease monthly depending on sales, timing of cash collections, production efficiencies, and availability of facilities. A working capital balance of about $5 million is needed to enable the program to continue to fill customer orders in a reliable fashion on a year-round basis.

Privatization of commercially viable isotopes, although successful, has placed additional pressure on the program's working capital. Commercial product revenues, which contributed to the infrastructure fixed cost, are no longer available. As a result, the infrastructure that enables the Department to provide vital isotopes to the nation's researchers is under greater financial strain. In response, the program is continuing to streamline its capability. However, in order to maintain a core competency of research and production staff and facilities for the production of research isotopes, the program is becoming more reliant on appropriations.

Moreover, working capital will enable the Program to maintain production capability and equipment purchases, thus avoiding delays or interruptions to research and clinical trials for new medical treatments. The Department agrees with the House Appropriation Subcommittee report for FY 2000 which expressed concern that demand for medical isotopes could require increased production of up to fourteen percent per year over the next twenty years. The Isotope Program must be positioned to respond to the anticipated future increase in demand for isotopes. If investments in maintenance and capital equipment are not made, the following are examples of the effects on the Program:

- Promising new treatments for cancer which use alpha isotopes are currently underway. However, upgrades in the alpha isotope production hot cell at Oak Ridge have been deferred due to lack of funding. These upgrades would allow processing of bismuth-212, a needed alpha isotope, which currently cannot be produced anywhere in the Department. Failure to fund hot cell upgrades and additional separation of these isotopes from surplus weapons materials will immediately interrupt

and reduce human clinical trials in the United States as the medical research community is attempting to establish promising new treatments to fight cancer.

- Hot cell windows throughout the complex need a high degree of maintenance because of the severe radiation effects on windows, manipulators and other equipment. This maintenance has been deferred and is urgently needed to maintain or increase our production of medical isotopes. Again, the potential outcomes are interruption in the supply of isotopes to research and medicine.

- The isotope program purchased chromatography equipment two years ago to separate short lived medical isotopes for supply to the medical community. This device has not been installed due to lack of funding. Again, our ability to supply needed research isotopes has been severely hindered.

The Department has taken early steps to address these facility issues and to support nuclear medicine research. The Significant Accomplishments and Program Shifts section includes a number of actions taken to date.

More strategically, the Nuclear Energy Research Advisory Committee (NERAC) is developing recommendations for the Department's long-term isotope research and production plan. This plan will consider creative approaches such as public-private partnerships for new isotope production facilities to serve the longer-term projected isotope needs.

In addition, researchers with innovative ideas in the use of isotopes for diagnosis and therapy of many diseases have had difficulty obtaining funding for areas of research that are not closely tied to specific isotopes, means of delivery and disease. The purpose of the ANMI is to support broad-based research on new uses of isotopes, including alpha emitters, for the diagnosis and therapy of life threatening diseases or other innovative medical applications. The Department is looking for applications in these areas with the view toward providing funding or the required isotopes as part of a research program.

Isotope production and research supports the latest draft of the Department's Strategic Plan and the FY 2001 Performance Plan as follows:

- *Science Objective 2* - Protect our living planet with scientific understanding of energy impacts on people and the biosphere.

- *Science Objective 4* - Provide the extraordinary tools, scientific workforce, and infrastructure that assure our Nation's leadership in the physical, biological, and computational sciences and in multidisciplinary research.

  - FY 2001 Strategy - The Department will develop new or improved isotope products and services that enable medical diagnoses and therapy and other applications that are in the national interest, and encourage private sector investment in new isotope production ventures and sell or lease facilities and inventories for commercial purposes.

Program Goals

- In collaboration with other Federal Agencies and Advisory Committees, develop new isotopes and isotope application technology to meet future national needs. *(Program Goal 1)*

- Provide a reliable supply of quality products and services based on customers' needs. *(Program Goal 2)*

- Support nuclear medicine research and development. *(Program Goal 3)*

Program Objectives

- Work with stakeholders, customers, and advisory groups to identify and develop new applications utilizing isotope products and technologies. *(Isotope Programs Objective 1 supports NE Program Goal 2)*

- Support and encourage advanced research applying research isotopes produced by the Department. *(Isotope Programs Objective 2 supports NE Program Goal 1)*

- Invest in new product processes and application development initiatives. *(Isotope Programs Objective 3 supports NE Program Goal 2)*

- Continue to improve product quality and services and enhance customer satisfaction. *(Isotope Programs Objective 4 supports NE Program Goal 3)*

- Ensure that environmental safety, health, and transportation safeguards requirements are met in the conduct of Isotope Programs site activities. *(Isotope Programs Objective 5 supports NE Program Goals 1, 2, and 3)*

- Achieve maximum private sector involvement in isotope activities by identifying those with privatization potential and then assisting the private sector in privatizing those that are commercially viable. *(Isotope Programs Objective 6 supports NE Program Goal 3)*

Performance Measures

- In FY 1999, initiate construction and commissioning of the Los Alamos Isotope Production Facility, improving isotope quality with greater operating efficiency. *(Performance Measure supports Isotope Programs Objective 3)* [Met Goal]

- In FY 1999, all major capital investments at the Hot Cell Facility and scheduled modifications of the Annular Core Research Reactor for emergency production of molybdenum-99 have been completed. In March 1999, a request for Technical/Business Strategy Concepts for producing and distributing was issued. After a detailed evaluation, it was determined that no private firm met the qualifications, hence no award was made. *(Performance Measure supports Isotope Programs Objective 6)* [Nearly Met Goal]

- By the end of FY 2000, complete at least 40 percent of the construction of the Los Alamos Isotope Production Facility, which is needed for the production of short-lived isotopes for medical research. *(Performance Measure supports Isotope Programs Objective 3)*

- By the end of FY 2001, complete 90 percent of the construction of the Los Alamos Isotope Production Facility, which is needed for the production of short-lived isotopes for medical research. *(Performance Measure supports Isotope Programs Objective 3)*

- In FY 2000, implement the Advanced Nuclear Medicine Initiative by providing isotopes or financial assistance for at least five to ten researchers. *(Performance Measure supports Isotope Programs Objective 3)*

- In FY 2001, continue implementation of the Advanced Nuclear Medicine Initiative by providing isotopes or financial assistance for at least seven to ten researchers. *(Performance Measure supports Isotope Programs Objective 3)*

- Issue a notice in the Commerce Business Daily and a concept paper for the privatization of the stable isotope inventory and material research laboratory by September 1999. *(Performance Measure supports Isotope Programs Objective 3)*

- Supply quality stable and radioactive isotopes for industrial, research, and medical applications that continue to meet customer specifications and maintain 95 percent on-time deliveries. *(Performance Measure supports Isotope Programs Objective 1)* [Exceeded Goal in FY 1999]

- In FY 2000 and FY 2001, invest in two new process development technologies each year, as requested by researchers, that enhance isotope production, services, and delivery application systems. *(Performance Measure supports Isotope Programs Objective 2)*

- Respond to customer requests for information within 48 hours. *(Performance Measure supports Isotope Programs Objective 1)*

- Assure complete customer satisfaction for no less than 97 percent of all product and service deliveries. *(Performance Measure supports Isotope Programs Objective 4)*

- Hold three annual stakeholder meetings in conjunction with international and regional trade shows and professional conferences. *(Performance Measure supports Isotope Programs Objective 4)*

Significant Accomplishments and Program Shifts

- Continue to serve at least 250 commercial and research customers each year by producing and distributing essential isotopes to meet national demand when no domestic or private sector capability exists, where unique Government production facilities are needed such as research reactors or large accelerators, or where non-Federal production capacity is insufficient to meet U.S. needs.

- In FY 2001, complete 90 percent installation of an upgraded research isotope production station at the Los Alamos Neutron Science Center in New Mexico in order to make accelerator-produced isotopes available to researchers for an entire year. Once the facility is operational in FY 2002, production will be coordinated among the Department's facilities at Brookhaven National Laboratory (BNL), Los Alamos National Laboratory (LANL), the Tri-University Meson Physics Facility in Canada, and other collaborating institutions outside the United States to achieve year-round availability of these isotopes.

- Substantially expand the availability of selected isotopes by installing a remote-controlled radioisotope separator at LANL. The separator will be completed and cold-tested in 1999-2000. Separation of selected radioisotopes will begin in 2000. Studies on separation of phosphorous isotopes will also be completed in FY 2000. Separation of phosphorus-32/phosphorous-33 will begin in fiscal year 2001. These isotopes are used for cancer treatment, bone pain therapy, and as biological tracers in studying DNA.

- Assembly of the xenon-127 processing apparatus at BNL will be completed in 1999. Cold and hot testing of the apparatus, preparation of an FDA Drug Master File, as well as xenon-127 shipments to researchers will be completed in FY 2000. Xenon-127 has been approved by the FDA for lung-ventilation studies and may be expanded to include brain scans.

- The calutrons at Oak Ridge National Laboratory (ORNL) can no longer produce and sell economic quantities of commercial stable isotopes. Foreign competitors sell stable isotopes below cost and there is a world-wide oversupply of electromagnetically separated stable isotopes. Unless there is private sector interest in operating the calutrons, the Department will no longer operate these machines. A large inventory of research isotopes exists at ORNL sufficient to serve research demand for at least four years.

- Design by FY 2001, a stable isotope enrichment machine that will provide low-volume, enriched stable isotopes to researchers at affordable prices and at reduced operating cost.

- Rhenium-188, a beta-emitting isotope that is obtained using tungsten/rhenium generators, is showing great promise for treatment of cancer, bone pain relief, and prevention of coronary restenosis. Demand for this isotope is expected to increase substantially in the next year. In order to optimize tungsten-188/rhenium-188 production, the Department has developed a pressed metallic tungsten-186 target that greatly increased production yield. This will result in a decrease in production costs.

- Iodine-125 is an important isotope in the treatment of prostate cancer. The Annular Core Research Reactor (ACRR) at Sandia National Laboratories (SNL), New Mexico, has been converted from defense work to isotope production. The ACRR is well suited to produce iodine-125 and many other isotopes. A commercial contract for iodine-125 production has been signed this year. The reactor will also be used to produce other isotopes such as iridium-192 wires used in cancer therapy (brachytherapy), which is used for bone pain therapy and other therapeutic applications. The reactor will also provide irradiation services for customer and will remain ready for mobilization in case of a serious interruption in the U.S. supply of molybdenum-99.

- Researchers throughout the United States are assessing alpha-emitting radioisotopes that can destroy cancer cells and reduce tumors. Alpha-emitters such as bismuth-213 have been demonstrated to be successful for cancer therapy. The Department will continue to provide limited support for production of these isotopes. Any changes or increases in demand, due to success in pre-clinical trials, may require a change in production capability and additional resources.

- The Department has established cooperative supply agreements with facilities in Russia and South Africa, and Isotope Programs will seek additional cooperative supply agreements with other isotope manufacturers to assure that the U.S. has a reliable diverse supply of important isotopes.

- Privatization of selected Isotope Programs activities will result in a decrease in both expenses and resources. As a result, the program is shifting its efforts to low volume, high cost research isotopes. The isotope program will continue to seek opportunities for the private sector to assume commercially attractive activities.

Funding Profile

(dollars in thousands)

	FY 1999 Current Appropriation	FY 2000 Original Appropriation	FY 2000 Adjustments	FY 2000 Current Appropriation	FY 2001 Request
Isotope Expenses					
Isotope Production	15,500	10,500	-45	10,455	11,615
Advanced Nuclear Medicine Initiative	0	2,500	0	2,500	2,500
Alpha Isotope Processing	0	0	0	0	900
Stable Isotope Enrichment Unit	0	0	0	0	300
Calutron Shutdown and Transfer of Inventory and Equipment	0	0	0	0	900
Research and Development	0	0	0	0	500
Construction	6,000	7,500	0	7,500	500
Total Isotope Support	21,500	20,500	-45 [a]	20,455	17,215

All appropriations for the Isotope Support decision unit fund a payment into the Isotope Production and Distribution Fund as required by P.L. 101-101 and as modified by P.L. 103-316. Requested funding is required to maintain financial continuity of radioactive and stable isotope research, development, production, processing, distribution, and associated services to commercial and research customers. Funding will also be used to provide radioisotopes and enriched stable isotopes for research and development, medical diagnosis and therapy, isotope applications, and to support nuclear medicine research.

[a] Includes the contractor travel savings distributed to this program.

Funding by Site [a]

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Albuquerque Operations Office					
Los Alamos National Laboratory	7,650	8,500	3,115	-5,385	-63.4%
Sandia National Laboratories	8,700	2,800	2,800	0	0.0%
Total, Albuquerque Operations Office	16,350	11,300	5,915	-5,385	-47.7%
Chicago Operations Office					
Brookhaven National Laboratory	2,000	2,100	3,000	900	42.9%
Oak Ridge Operations Office					
Oak Ridge National Laboratory	2,800	3,309	5,100	1,791	54.1%
Richland Operations Office					
Pacific Northwest National Laboratory	350	0	200	200	100.0%
Washington Headquarters	0	0	0	0	0.0%
All Other Sites	0	3,746	3,000	-746	-19.9%
Total, Isotope Support	21,500	20,455	17,215	-3,240	-15.8%

Site Descriptions

Los Alamos National Laboratory

Los Alamos National Laboratory (LANL) is a U.S. Department of Energy (the Department) scientific research laboratory located in New Mexico. The new 100 MeV Isotope Production Facility (IPF) at LANL will use the proton beam of the Los Alamos Neutron Science Center (LANSCE) Linear Accelerator. The IPF may operate up to 8 months per year in conjunction with other programs. This will be an increase in operating time of 20 weeks from FY 1999. The unique characteristics of the LANSCE accelerator include a high-energy, high-current beam that allows production of higher quality radioisotopes, as well as exotic radioisotopes that cannot be produced in other facilities. Three major products produced at the site are germanium-68, a calibration source for Positron Emission Tomography (PET) scanners; strontium-82, the parent of rubidium-82, used in cardiac PET imaging; and sodium-22, a positron-emitter used in neurologic research.

[a] Since Isotope Programs operates like a business, funding at isotope production sites can increase or decrease depending on demand, cash collections, production efficiencies, and availability of facilities.

Sandia National Laboratories

Sandia National Laboratories (SNL) is a Department of Energy (the Department) scientific research laboratory located in New Mexico. SNL's Annual Core Research Reactor (ACRR) is a 2-megawatt, pool-type research reactor that is used to produce isotopes for medical applications. The ACRR is a highly flexible facility applied to the mission requirements of the Department in both isotope and national security applications. The Department plans to produce iodine-125 at this facility, which has several uses, including seed implants for treating prostate cancer, as well as several other isotopes, including iridium-192, which is used in cancer therapy.

In addition, all major capital investments at the Hot Cell Facility and scheduled modifications of the ACRR for emergency production of molybdenum-99 have been completed. Molybdenum-99 is a precursor of technetium-99m, an isotope that is used in over 36,000 medical procedures per day in the United States to diagnose maladies such a cancer and heart disease. The Hot Cell Facility and portions of Chemical and Metallurgy Research Facility used for molybdenum-99 have been placed in a standby mode, pending privatization of the Department’s molybdenum-99 production capability.

Brookhaven National Laboratory

Brookhaven National Laboratory (BNL) is a U.S. Department of Energy (the Department) scientific research laboratory located on Long Island, New York. The Brookhaven Linear Isotope Producer (BLIP) at BNL uses a linear accelerator that injects 200 million-electron-volt protons into the 33 giga-electron-volt Alternating Gradient Synchrotron. The BLIP facility operates about 16 weeks per year and produces radioisotopes such as strontium-82, germanium-68, copper-67, and others that are used in medical diagnostic applications. BNL is also active in the development of new isotope processes and delivery systems.

Oak Ridge National Laboratory

Oak Ridge National Laboratory (ORNL) is a U.S. Department of Energy scientific research laboratory located in Oak Ridge, Tennessee. The High Flux Isotope Reactor (HFIR) at ORNL provides one of the world's highest steady-state neutron fluxes. The reactor is normally scheduled to operate about 43 weeks per year to support primary missions other than isotope production. Isotope products made at this facility include: tungsten-188, rhenium-186, californium-252, and iridium-192. One target position, with hydraulic capability to simultaneously load and unload up to eight targets is available and is heavily used for medical radioisotope production. Additional peripheral target positions became available in the second half of fiscal year 1999. The program depends heavily on HFIR for isotope production. The program also maintains the Hot Cell Facility, Building 3047, at ORNL to process and package its radioisotope. In addition, one of the cells in Building 3047 is being modified to accommodate processing alpha isotopes to meet future demand.

Currently, the electromagnetic calutrons at ORNL have been placed in a cold-standby mode with minimum maintenance. Unless other options appear soon, in FY 2001 the calutrons will be shut down and transferred to the Department's Environmental Management Program for disposition. The FY 2001 request includes funding for this transition. All laboratory equipment and stable isotope inventories will be transferred to site area X-10 at Oak Ridge or to the private sector. In addition, the Department is planning to design and install by FY 2002, a stable isotope enrichment unit that can produce isotopes for researchers at affordable prices.

All Other Sites

This category includes providing direct assistance to universities or research institutions, or to the Department's laboratories yet to be determined for producing isotopes or related reviews or to fund isotope related research based on a peer-reviewed selection process.

Operating Expenses

Mission Supporting Goals and Objectives

The U.S. Department of Energy (the Department), through the Office of Isotope Programs (Isotope Programs), provides radioactive and stable isotope products and associated services to a wide and varied domestic and international market. Ultimate applications of isotope products include medical research and health care, industrial research and manufacturing, education, and national defense. The Isotope Programs' mission is to serve the national need for a reliable supply of isotope products and services and related science and technology used in medicine, industry, and research. Isotope Programs supports development of new or improved isotope products and services that enable medical diagnoses and therapy and other applications that are in the national interest. Prices charged for these products and services may not always achieve full-cost recovery to the Government. If private sector production becomes well established, the Department will no longer supply that particular isotope.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Operation Expenses	15,500	12,955	16,715	3,760	29.0%
Construction	6,000	7,500	500	-7,000	-93.3%
Total, Isotope Support	21,500	20,455	17,215	-3,240	-15.8%

Detailed Program Justification

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Operating Expenses			
# **Isotope Production**			
< This increase in funding will enable Isotope Programs to maintain core personnel and capabilities at four sites. This will enable the production, packaging, and distribution of radioactive and stable isotopes for about 20 major products and related services and processing of hundreds of forms and types of isotopes for medical and scientific research. This estimate was based on serving about 250 customers and over 1,100 deliveries.	10,300	10,455	11,615
< Processing of Alpha Isotopes – Process uranium material to obtain alpha-emitting isotopes that will be used in medical research and human clinical trials for the cure of various cancers: **S** Process uranium-233 to obtain thorium-229 for production of actinium-225 **S** Process uranium-232 to obtain thorium-228 for production of radium-224. **S** Process waste material to obtain actinium-227 for the production of radium-223.	0	0	900
< Molybdenum-99 Initiative - All major capital investments at the Hot Cell Facility, Sandia National Laboratories for emerging production of Mo-99, have been completed. An inventory of targets has been produced. The facility has been placed in a standby mode pending privatization of molybdenum-99 production capability. No funding is requested.	5,200	0	0
< Stable Isotope Enrichment Unit – Design a stable isotope enrichment unit that will provide stable isotopes to researchers at affordable prices and will reduce the Government's cost to operate. The isotope enrichment device will be a small modular calutron or other device whose capacity could be altered in the future to meet increases in demand.	0	0	300

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
< Calutrons Shut Down – Shut down calutrons and transfer to the Office of Environmental Management for final environmental cleanup.	0	0	900
< Isotope Product and Process Improvement - Conduct research to make new or existing isotope products more efficiently, more cost effectively, and enable the program to respond to the evolving needs of research customers. . .	0	0	500
< Advanced Nuclear Medicine Initiative: S Sponsor nuclear medical science using a peer review selection process. The Department's support will be in two forms: direct research financial assistance and make isotopes available for research at prices that researchers can afford; S Encourage the training of individuals in nuclear medicine methods by establishing university scholarships and fellowships for nuclear medicine specialists and by sponsoring summer internships at appropriate institutions; S Initiate a focused program in the U.S. to support research in alpha-emitting isotope applications to fight a spectrum of malignant diseases including most common cancers and infectious diseases such as meningitis.	0	2,500	2,500
Total, Operating Expenses	15,500	12,955	16,715

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Construction			
# Commission the Isotope Production Facility at the Los Alamos Neutron Science Center. Complete engineering, design, and construction work inside the existing beam tunnel. Engineering and design of the new tunnel section and target station will be completed. Construction of the target station and new beam tunnel section was started in FY 1999 and will be 90 percent complete by FY 2001.	6,000	7,500	500
Total, Isotope Support	21,500	20,455	17,215

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
Operating Expenses	
# Increase in production costs to meet demand for medical and scientific research isotopes.	1,160
# Process uranium material to obtain alpha-emitting isotopes used in medical research and human clinical trials.	900
# Shutdown the calutrons and move the Oak Ridge business activities and the Isotope Materials laboratory to a lower cost location within ORNL or to the private sector.	900
# Design a Stable Isotope Enrichment Unit to enable the Department to continue its supply of stable isotopes to U.S. researchers.	300
# Invest in product and process improvements which will result in new or improved isotope products or more efficient isotope production methods.	500
Total, Operating Expenses	3,760
Construction	
# Construct the Los Alamos Target Irradiation Station for accelerator, medical, and research isotopes.	-7,000
Total Funding Change, Isotope Support	-3,240

Capital Operating Expenses & Construction Summary

Construction Projects

(dollars in thousands)

	Total Estimated Cost (TEC)	Prior Year Approp-riations	FY 1999 Approp.	FY 2000 Approp.	FY 2001 Approp.	Unapprop. Balance
99-E-201, Isotope Production Facility, TA-53	14,000	0	6,000	7,500	500	0
Total, Construction		0	6,000	7,500	500	0

99-E-201, Isotope Production Facility, TA-53, Design and Construction, Los Alamos National Laboratory, Los Alamos, New Mexico

(Changes from FY 2000 Congressional Budget Request are denoted with a vertical line [|] in the left margin.)

Significant Changes

| This $500K request for the Isotope Production Facility (IPF) is being submitted to restore the total project funding to the amount identified in the FY 2000 budget request. The submittal reflects actual project costs to date. An extensive amount of project contingency has been consumed maintaining the aggressive project schedule, noting that Architectural-Engineering (A-E) work was not commenced in the 1Q FY 1998 as originally envisioned. The need to complete this facility as quickly as possible is driven by the fact that the Office of Isotope Programs is no longer able to irradiate targets at the Los Alamos Neutron Science Center (LANSCE) impacting its ability to meet its programmatic mission. The project was subjected to an Independent External Review in FY 1999 that concluded the project was fully justified and well poised for success, but noted the project's success is contingent upon the timely scheduling of a LANSCE accelerator outage to support construction excavation activities. The facility construction Request for Proposal was issued on December 10, 1999, with a bid submittal due date of January 13, 2000. An independent facility construction cost has been prepared to assist in the bid evaluations and estimates an increase in facility construction costs of $667K; project cost estimates will be updated upon final contractor selection. Total project costs have increased $189K to address expanded hazard analysis and safety documentation requirements and an operational readiness review. A biological assessment submitted to the United States Department of the Interior, Fish and Wildlife Service noted that the facility construction "may affect, but not likely to adversely affect" the Mexican spotted owl, an endangered species whose potential nesting area is near the facility construction location.

1. Construction Schedule History

	Fiscal Quarter				Total Estimated Cost ($000)	Total Project Cost ($000)
	A-E Work Initiated	A-E Work Completed	Physical Construction Start	Physical Construction Complete		
FY 1999 Budget Request *(Preliminary Estimate)*	1Q 1998	4Q 1998	1Q 1998	2Q 2000	12,065	12,843
FY 2000 Budget request	1Q 1999	1Q 2000	1Q 1999	3Q 2001	14,000	15,520
FY2001 Budget request (Current Baseline Estimate)	1Q 1999	1Q 2000	1Q 1999	3Q 2001	14,000	15,709

2. Financial Schedule

(dollars in thousands)

Fiscal Year	Appropriations	Obligations	Costs
Design			
1999	2,805	2,805	2,634
2000	91	91	895
Construction			
1999	3,195	3,195	232
2000	7,409	7,409	8,288
2001	500	500	1,951

3. Project Description, Justification and Scope

This project proposes to build a new target irradiation facility for the production of radioisotopes at the Los Alamos Neutron Science Center (LANSCE) accelerator. The project started in FY 1999 will include installation of a beam switching device at the point where the beam is diverted, construction of a short beam line to the targeting area, and construction of a target handling facility with a beam stop. This facility will utilize a 100 MeV proton beam obtained by diverting a portion of the main LANSCE beam before it enters the final portion of the accelerator and directing it to a new targeting area dedicated to isotope production. In most cases production of radioisotopes is both more efficient and more selective with low beam energies (100 MeV) than with the high beam energy currently being used at Los Alamos (800 MeV). Therefore, once the new facility is in operation, the program will continue to produce most of the same isotopes, but with greater efficiency.

The proposed target irradiation facility will replace the existing Isotope Production Facility, which is located at TA-53 in building MPF-3 at the east end of Area A of LANSCE. However, Area A, where the existing Isotope Production Facility is located, will be rendered inoperable by the proposed reconfiguration of the LANSCE accelerator complex thereby, preventing Los Alamos to produce these isotopes.

The Isotope Program has been one of the more successful and visible ongoing activities at Los Alamos. It has used the unique capabilities of the Laboratory's facilities and staff to respond to a well recognized national need for radioisotope production and development. Today there are many customers in industry, research institutions, the medical community, academia, and other agencies who purchase the 30+ radioisotopes produced in the Isotope Production Facility at LANSCE. The current Laboratory plan to redirect the focus of the LANSCE accelerator complex toward neutron science has placed the use of the existing Isotope Production Facility in jeopardy. This change in focus can be viewed as an opportunity for the Isotope Production and Distribution Program to construct a dedicated radioisotope production facility which can operate on a noninterference basis with any of the proposed LANSCE configurations while at the same time operating at a lower beam intensity than the present Isotope Production Facility.

This new facility would advance the Department of Energy's objective to be a reliable domestic source of research radioisotopes crucial for the future of industry, education and medicine.

The proposed facility would be located on the north side of the LANSCE linear accelerator (linac) building near the west end of the accelerator complex. A beam line would be built from the transition region between the Drift Tube Linac and the Side Coupled Cavity Linac extending to the northeast to a targeting facility located to the north of Sector A. The new beam line will be approximately 100 feet in length with the beam line center expected to be between 20 and 35 feet below grade. The targeting facility would be located within a new building located above the end of the beam line. This building will be approximately 3000 square feet in area, and will house all the necessary equipment and control systems for carrying out target irradiations. This building will include a high bay area with overhead cranes.

This project will include design, excavation, and construction of the beam line tunnel, design and construction of the beam line and its control systems, design and construction of the building to house the targeting facility, and design and construction of the target handling and control systems. Currently the project is progressing well within the baseline schedule and will meet the scheduled operational date of May 2001. The IPF facility design contract has been completed and a procurement action initiated for the facility construction. Procurement actions have also been initiated for all major beam line components. Future schedule changes will be made to accommodate accelerator outages at the LANSCE in that major earth moving and IPF equipment installation cannot occur when the accelerator is operating in support of other Defense Programs or Office of Science missions. The scheduled accelerator outage date continues to be delayed well into the Spring of 2000. Additional delays in the accelerator outage schedule will impact the operational date of May 2001.

From a historical perspective, the IPF project was validated by the Office of Nuclear Energy, Science and Technology on cost, schedule and technology in August 1997. This validation was based on funding of $8M in FY 1999, $4M in FY 2000, and detailed design commencing in FY 1998. The design effort in FY 1998 was to have been funded via a no-funds reprogramming or similar financial instrument. Consistent with this validation, the FY 1999 budget request was based on the assumption that detailed design work would begin in the 1Q 1998. Subsequent to the FY 1999 budget request, The Office of Isotope Programs was not authorized to fund these detailed design activities, thereby delaying the actual start of the detailed design until the 1Q 1999.

During the internal DOE budget review process, the final FY 1999 budget submittal was revised from the validated funding profile of $8M in FY 1999 and $4M in FY 2000 to $6M in FY 1999 and $6M in FY 2000 without fully evaluating the impact on all aspects of the project. Although the total request remained at $12M, it was determined that this new funding profile would not adequately cover schedule impacts, escalation, protracted mobilization costs or efforts to avoid increasing the project duration.

In an effort to offset the project duration increase caused by the project funding profile in the FY 1999 budget, the FY 2000 budget request was raised an additional $1.935M to cover an increase in contractor resources along with associated management oversight costs ($675K increase). Escalation due to delayed activities accounted for an increase of approximately $100K. Additionally, based on a project

review by the Los Alamos Neutron Science Center (LANSCE) Review committee and by an independent contract organization sponsored by the Albuquerque Operations Office, it was concluded that the planned contingency was too low given the experiences of similar retrofit projects recently completed at LANSCE. The contingency for the project was raised from 15% to 24% ($1.16M increase).

4. Details of Cost Estimate

(dollars in thousands)

	Current Estimate	Previous Estimate
Design Phase		
Preliminary and Final Design (Design, Drawings, and Specifications)	2,215	1,537
Design Management costs (3.3% of TEC)	466	321
Project Management costs (6.1% of TEC)	848	303
Total, Design and Management Costs (25.2% of TEC)	3,529	2,161
Construction Phase		
Improvements to Land	521	521
Buildings	3,746	3,229
Special Equipment	3,280	3,296
Utilities	55	158
Inspection, design and project liaison, testing, and acceptance	1,056	852
Construction Management (1.2% of TEC)	162	298
Project Management (6.8% of TEC)	945	773
Total, Construction Costs	9,765	9,127
Contingencies		
Design	0	737
Construction	706	1,975
Total, Contingencies (5.0% of TEC)	706	2,712
Total, Line Item costs (TEC)	14,000	14,000

5. Method of Performance

Procurement will be accomplished under fixed-price contracts awarded on the basis of competitive bidding. The M&O contractor and contracted Architect-Engineers will perform construction inspection.

6. Schedule of Project Funding

(dollars in thousands)

	Prior Years	FY 1998	FY 1999	FY 2000	FY 2001	Out Years	Total
Project cost							
Facility cost							
Design	0	0	2,634	895	0	0	3,529
Construction	0	0	232	8,288	1,951	0	10,471
Total, Line Item (TEC)	0	0	2,866	9,183	1,951	0	14,000
Other project costs							
Conceptual Design costs . .	0	545	0	0	0	0	545
Other ES&H costs	0	93	100	33	86	0	312
Other project related costs [a]	0	652	200	0	0	0	852
Total, Other project costs	0	1,290	300	33	86	0	1,709
Total Project Cost (TPC)	0	1,290	3,166	9,216	2,037	0	15,709

7. Related Annual Funding Requirements

(FY 2003 dollars in thousands)

	Current Estimate	Previous Estimate
Annual facility operating costs	285	285
Annual facility maintenance/repair costs	111	111
Utility costs	39	39
Total related annual funding	435	435
Total operation cost (operating from FY 2003 through FY 2022)	8,700	8,700

[a] Other project related costs - This item includes the costs for creating as-builds for the existing facility beamline, shielding calculations, and engineering studies to refine the magnet, beamline and target designs to integrate into the existing facility.

Program Direction

Mission Supporting Goals and Objectives

The Office of Nuclear Energy, Science and Technology (NE) Program Direction account funds expenses associated with the technical direction and administrative support of NE programs.

Program Direction has been grouped into four categories:

"Salaries and Benefits" provides salary and benefits funding for Headquarters and Operations Office personnel providing technical direction to Nuclear Energy Research and Development activities, Isotope Programs, Termination Cost programs, Uranium Programs, the Fast Flux Test Facility (FFTF), as well as the Office of Science funded energy research reactor operations (*e.g.*, the High Flux Isotope Reactor at the Oak Ridge National Laboratory), and activities funded by other Federal agencies and foreign governments. This category includes funding for other personnel compensation, such as, cash incentive awards and overtime pay. The Department of Energy has conducted detailed workforce analyses that have identified current and projected staffing disciplines. During 1999, DOE conducted a systematic analysis of critical staffing needs within the context of current and projected R&D program missions. The Department will develop a comprehensive plan that will focus on building and sustaining a talented and diverse workforce of R&D Technical Managers. The plan will include innovative recruitment strategies, retention incentives, comprehensive training and development programs for new and current employees, and succession planning. The FY 2001 Program Direction request for the Office of Nuclear Energy includes $150,000 for the Scientific Retention and Recruitment Initiative. This will enable the recruitment of experienced scientists and engineers in areas of emerging interest to the Department's nuclear energy mission. Funds will also be used to motivate and retain highly skilled, top-performing technical managers with, for example, retention allowances and performance awards. Additionally, training in areas crucial for effective job performance will be a key element of the initiative.

"Travel" includes funding for transportation of Headquarters and Operations office employees associated with NE programs, their per diem allowances while in authorized travel status, and other expenses incidental to travel.

"Support Services" includes funding for technical and management support services provided to NE Headquarters and Operations office employees. NE does not rely on expert contractors from the national laboratories to manage NE programs in place of Federal staff. NE requires its senior technical managers to be Federal employees with significant experience necessary to accomplish program objectives. To reduce support services costs, NE has retrained and redeployed staff to reduce dependence on contractors while meeting growing needs in programs such as our University program and the Nuclear Energy Research Initiative. NE has also retrained administrative staff to replace contractors providing graphics services.

"Other Related Expenses" includes funding for administrative expenses, such as: training, computer hardware and software acquisitions, modifications, and publication and subscription services. In addition, the Department's Office of Management and Administration (MA) established a Working Capital Fund to provide funding for mandatory administrative costs, such as, rent and telephone services. Payments into this fund reflect usage of Fund services which are priced and charged to users in accordance with policies established by the Working Capital Fund Board.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Albuquerque					
Travel	2	0	0	0	0.0%
Chicago					
Salaries and Benefits	1,239	1,364	1,465	+101	+7.4%
Travel	82	67	70	+3	+4.5%
Support Services	29	29	30	+1	+3.4%
Other Related Expenses	138	81	88	+7	+8.6%
Total, Chicago	1,488	1,541	1,653	+112	+7.3%
Full Time Equivalents	12	12	12	0	0.0%
Idaho					
Salaries and Benefits	95	104	104	0	0.0%
Travel	10	10	10	0	0.0%
Support Services	0	0	0	0	0.0%
Other Related Expenses	3	3	3	0	0.0%
Total, Idaho	108	117	117	0	0.0%
Full Time Equivalents	1	1	1	0	0.0%
Oak Ridge					
Salaries and Benefits	2,234	2,412	3,155	+743	+30.8%
Travel	90	150	220	+70	+46.7%
Support Services	370	371	385	+14	+3.8%
Other Related Expenses	951	507	490	-17	-3.4%
Total, Oak Ridge	3,645	3,440	4,250	+810	+23.5%
Full Time Equivalents [a]	27	27	32	5	+18.5%
Oakland					
Salaries and Benefits	208	108	108	0	0.0%
Travel	10	7	10	+3	+42.9%
Support Services	0	0	0	0	0.0%
Other Related Expenses	24	23	23	0	0.0%
Total, Oakland	242	138	141	+3	+2.2%
Full Time Equivalents [a]	2	1	1	0	0.0%

[a] Excludes reimbursables.

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Richland					
Salaries and Benefits	451	622	653	+31	+5.0%
Travel	15	16	16	0	0.0%
Support Services	0	0	0	0	0.0%
Other Related Expenses	6	0	0	0	0.0%
Total, Richland	472	638	669	+31	+4.9%
Full Time Equivalents	5	6	6	0	0.0%
Ohio					
Salaries and Benefits	0	0	0	0	0.0%
Travel	5	0	0	0	0.0%
Support Services	0	0	0	0	0.0%
Other Related Expenses	0	0	0	0	0.0%
Total, Ohio	5	0	0	0	0.0%
Full Time Equivalents	0	0	0	0	0.0%
Headquarters					
Salaries and Benefits	12,459	11,928	13,180	+1,252	+10.5%
Travel	676	570	625	+55	+9.6%
Support Services	3,273	4,380	4,478	+98	+2.2%
Other Related Expenses	2,330	1,948	2,507	+559	+28.7%
Total, Headquarters	18,738	18,826	20,790	+1,964	+10.4%
Full Time Equivalents	126	119	119	0	0.0%
Total Nuclear Energy					
Salaries and Benefits	16,686	16,538	18,665	+2,127	+12.9%
Travel	890	820	951	+131	+16.0%
Support Services	3,672	4,780	4,893	+113	+2.4%
Other Related Expenses	3,452	2,562	3,111	+549	+21.4%
Total, Program Direction	24,700	24,700	27,620	+2,920	+11.8%
Full-Time Equivalents	173	166	171	+5	+3.0%

Detailed Program Justification

(dollars in thousands)

	FY 1999	FY 2000	FY 2001
Salaries and Benefits			
# NE Headquarters has streamlined its organizational structure from a multi-layered organization to a single-layered organization; downsized from 258 employees in 1993 to a current level of 104 employees; met Strategic Alignment Initiative staffing targets; met or exceeded National Partnership for Reinventing Government targets; retrained and redeployed administrative staff to reduce dependence on contractors; and continuously redirected and realigned staff to accomplish program goals efficiently and effectively. As part of the Department's Workforce 21 initiative, authorization has been received for 119 Headquarters positions to replenish critical technical expertise such as that required to assure the safe operation of the Department's various reactor facilities and to carry out new responsibilities such as the Depleted Uranium Hexafluoride Conversion project. The current assignment of NE field employees paid from the NE KK Program Direction account, includes Chicago Operations Office (12), Idaho Operations Office (1), Oakland Operations Office (1), Oak Ridge Operations Office (27), and the Richland Operations Office (6). FY 2001 funding is based on Workforce 21 staffing levels plus 5 additional FTEs required to manage ES&H, particularly, transuranic and materials recycling issues, and conversion activities at the Paducah, Kentucky and Portsmouth, Ohio site offices, and escalation. The FY 2001 funding also includes $150,000 for the Scientific Retention and Recruitment Initiative.	16,686	16,538	18,665

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Travel			
# In accordance with the Departmental initiative to minimize travel costs, a series of actions have been taken with regard to Headquarters travel. Guidelines were issued to eliminate unnecessary or low value travel, multiple travelers to the same location/meeting are being limited. Conference attendance is being severely limited. Use of video-conferencing is encouraged whenever possible. NE field employees travel costs are similarly included in the Departmental travel costs reduction initiative. FY 2001 funding is based on increased travel requirements in support of new and growing programs, such as the Department's DUF_6 project, conversion and ES&H related reviews at Portsmouth and Paducah sites, and escalation.	890	820	951
Support Services			
In accordance with the Departmental initiative to reduce the level of support services contracting, NE has reduced Headquarters support services contracting from $10.6 million in support services contracts in FY 1995. Most recently, NE has undertaken a special effort to minimize Advanced Radioisotope Power Systems Program support services. Beginning in FY 1999, in accordance with Congressional direction, all funds for support services contracting were included in the Program Direction budget. FY 1999 funds include both Headquarters ($ 3.3 million) and Field ($ 0.4 million) support services contracting. NE had requested an additional $1.7 million be reprogrammed in FY 1999 to provide essential support for the Nuclear Energy Research Advisory Committee, the Nuclear Energy Research Initiative, depleted uranium hexafluoride management, advanced radioisotope power system design and safety analysis, and isotope privatization. However, given the urgency created by potential job losses at Portsmouth, Ohio, and Paducah, Kentucky, NE was required to withdraw $1.7 million from the reprogramming request for support contracting activities and use the funds for these sites. The FY 1999 support services funding shortfall resulted in a deferral of work in several programs and increases in the FY 2000 and FY 2001 support services budgets. FY 2001 funding is based on the revised FY 1999 request level, escalation, and increased requirements for high priority programs, such as the Department's DUF_6 project.	3,672	4,780	4,893

(dollars in thousands)

	FY 1999	FY 2000	FY 2001
Other Related Expenses			
The single largest expenditure ($1.500 million in FY 2001) in the other related expenses category is earmarked for the Headquarters Working Capital Fund (WCF). The Department's Office of Management and Administration (MA) established a Working Capital Fund to provide funding for mandatory administrative costs, such as, rent and telephone services. Payments to this fund reflect usage of Fund services which are priced and charged to users in accordance with policies established by the Working Capital Fund Board. The Other Related Expense category also includes support for the Nuclear Energy Research Advisory Committee. Finally, this category includes expenses for Automated Data Processing (ADP) hardware and software support, training, periodicals and subscriptions, etc.	3,452	2,562	3,111
Total, Program Direction	24,700	24,700	27,620

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
Salaries and Benefits	
# Increase is due to escalation on salaries and benefits, in accordance with established guidelines (+800), an approximate 1% increase for promotions and within grade salary increases (+200), one additional FTE at Headquarters funded by the Office of Civilian Radioactive Waste Management in FY 2000 (+130), and an adjustment for the full year cost of new hires brought on-board throughout FY 2000 (+462).	1,592
# Salaries and benefits for 5 FTEs required to manage ES&H and conversion activities at the Paducah and Portsmouth sites.	535
Travel	
# Increase attributable to escalation (+32) and additional requirements at HQ (+34) and Oak Ridge (+65).	131
Support Services	
# Increase attributable to escalation (+113).	113
Other Related Expenses	
# Increase attributable to escalation (+50) and other expenses such as, office space and ADP support for new hires (+199) and NERAC meeting support (+300).	549
Total, Program Direction	2,920

Support Services

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Technical Support Services					
Feasibility of Design Considerations	426	698	720	22	3.2%
Economic and Environmental Analysis	1,041	1,541	1,590	49	3.2%
Test and Evaluation Studies	995	1,112	1,149	37	3.3%
Total, Technical Support Services	2,462	3,351	3,459	108	3.2%
Management Support Services					
ADP Support	498	600	600	0	0.0%
Administrative Support Services	712	829	834	5	0.6%
Total, Management Support Services	1,210	1,429	1,434	5	0.3%
Total, Support Services	3,672	4,780	4,893	113	2.4%

Other Related Expenses

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Working Capital Fund	1,505	1,312	1,500	188	14.3%
Nuclear Energy Research Advisory Committee	250	200	500	300	150.0%
ADP/TeleVideo Hardware and Software	302	275	325	50	18.2%
Subscriptions/Publications	22	15	15	0	0.0%
Training	64	45	45	0	0.0%
Other Miscellaneous	1,207	650	661	11	1.7%
Office Logistical Support	102	65	65	0	0.0%
Total, Other Related Expenses	3,452	2,562	3,111	549	21.4%

Uranium Programs

Program Mission

This program supports important government activities related to the Federal Uranium Enrichment Program that were not transferred to the United States Enrichment Corporation (USEC Inc.). The Program incorporates the following main areas: management of leased and non-leased facilities at the Paducah, Kentucky and Portsmouth, Ohio sites; pre-existing liabilities; management of the Department's inventory of depleted uranium hexafluoride (DUF_6) and management of other surplus uranium inventories.

The management of leased and non-leased facilities at the two gaseous diffusion plants includes maintenance of facilities and grounds, cleaning legacy polychlorinated biphenyls (PCB) spills in the leased areas of the diffusion sites consistent with the Federal Facilities Compliance Act; and disposition of highly enriched uranium (HEU) material stored at the Portsmouth site. In addition, after assisting in the transfer of regulatory oversight of the leased facilities and obtaining an initial certificate of compliance from the Nuclear Regulatory Commission (NRC), the Department continues to review and update the Safety Analysis Reports (SARs) as necessary for the non-leased facilities and coordinate with the NRC in preparing annual congressional reports on the status of the diffusion plants.

In addition, in the latter part of FY 1999, the DOE Office of Environment, Safety and Health (ES&H) conducted an independent investigation at the Paducah Gaseous Diffusion Plant (GDP) site which identified issues pertaining to ES&H, including the need for resolution of criticality safety deficiencies in the DOE Material Storage Areas (DMSAs) and improved DOE oversight of contractors to ensure effective implementation of DOE and regulatory requirements. The report on this investigation was issued in October 1999.

In December 1999, DOE implemented a Corrective Action Plan (CAP) to address the issues identified in the ES&H report. Corrective actions have been taken to characterize and mitigate the criticality safety deficiencies in the DMSAs, and DOE oversight of contractor performance was strengthened by increasing Federal staff responsible for oversight activities and establishment of formal, regularly scheduled reviews of contractor performance of all sites responsibilities including ES&H.

The second main activity of the Uranium Programs, in accordance with the Energy Policy Act of 1992, is to fund all financial liabilities associated with the operations of the Portsmouth and Paducah GDPs prior to the establishment and after the privatization of USEC Inc. The liabilities include post retirement life and medical costs for Lockheed Martin and the Ohio Valley Electric Corporation, and litigation expenses related to on-going lawsuits against the Department's contractors.

The third main activity of the Uranium Programs is the management of the Department's DUF_6 inventory. The program is divided into two sub-activities: DUF_6 storage cylinder management and the DUF_6 conversion project. The Department's DUF_6 storage cylinder management is designed to ensure that its approximately 57,600 DUF_6 storage cylinders, located at the Paducah GDP site in Kentucky, the Portsmouth GDP site in Ohio, and the East Tennessee Technology Park (ETTP) in Tennessee, are maintained in an environmentally responsible manner by conducting annual storage cylinder inspections,

and developing and implementing options to repair cylinders exhibiting accelerated corrosion. The DUF_6 storage cylinder management effort is consistent with the consent agreements between the Department and the States of Ohio and Tennessee, and Recommendation 95-1 of the Defense Nuclear Facility Safety Board (DNSFB). In addition to the appropriations received for management of the Department's DUF_6, the Department received $66 million in FY 1998 from USEC Inc. for the management and disposition of approximately 11,200 cylinders transferred from USEC to the Department, which are included in the 57,600 DUF_6 storage cylinder total. These funds are administered in accordance with the terms of two Memoranda of Agreement (MOAs) and related correspondence.

The Department's DUF_6 inventory of 57,600 cylinders contain approximately 700,000 metric tons of material. While this material is currently stored safely and is the subject of a comprehensive maintenance program, the Department recognizes that it must deal with the final disposition of this inventory. The DUF_6 conversion project is focused on the design, construction and operation of plants to chemically process the DUF_6 to create products that would present both a lower long-term storage hazard and provide a material that would be suitable for use or disposal.

During FY 1999, the Department's DUF_6 conversion project completed a Programmatic Environmental Impact Statement (PEIS) on the management of its DUF_6 inventory and concluded, in a Record of Decision, that it would seek to convert the Department's inventory of DUF_6 into a more stable form that would make it acceptable for disposal, or reuse if applications for the material are found. The Department also issued a plan to carry out this conversion as required by P.L. 105-204, as well as a draft request for proposals (RFP) to find a private sector firm to design and construct the required DUF_6 conversion plants. The Department had planned to issue a final RFP around the end of 1999.

However, the Department has had to confront the possibility that the DUF_6 inventory could be contaminated with transuranic materials such as plutonium and neptunium. DOE experts and potential bidders recognized that this contamination could impact the design and operation of the proposed conversion plants, and the steps taken to protect workers at such plants. As a result, DOE launched an assessment of available historic information about the transuranic content of the DUF_6 stored by DOE and a cylinder sampling program.

The historical information available yielded very limited results, forcing the Department to rely almost entirely on sampling to assure a complete understanding of the level of transuranics contained in the DUF_6 inventory. This sampling is now underway and will continue into the middle of FY 2000. The Department will soon issue a new schedule reflecting the change this development will have on its procurement strategy but intends to meet the deadline established in P.L. 105-204.

In the interim, the Office of Nuclear Energy, Science and Technology will work with other Departmental elements, particularly the newly-formed Office of Engineering and Construction Management, to further refine the Department's procurement approach to assure its quality and ultimate success. The Department anticipates that a formal request for proposals will be issued later this calendar year. The FY 2001 budget request reflects the funds required to enable a contractor to initiate conversion plant design activities. The Department plans to match the $12 million indicated in the request with another $12 million from funds obtained from the U. S. Enrichment Corporation under memorandas of agreement signed in 1998.

Finally, this program is responsible for the Department's surplus inventory of uranium. This involves the storage of the material and supporting the Secretary of Energy's determinations with regard to the sale of excess Departmental uranium.

The Uranium Programs supports the latest draft of the DOE Strategic Plan and the FY 2001 Performance Plan as follows:

Environmental Quality Objective 5 - Manage the material and facility legacies associated with the Department's uranium enrichment activities.

-FY 2001 Strategy - The Department will: (1) continue its effort to safely maintain its inventory of depleted uranium hexafluoride and prepare quickly to convert this material to a more stable form; and (2) meet all commitments made to the Ohio Environmental Protection Agency, Tennessee's Department of Environment and Conservation, and the Defense Nuclear Facilities Safety Board to ensure the safety of the Department's inventory of DUF_6.

Program Goals

Manage Office of Nuclear Energy, Science and Technology (NE) activities at Portsmouth, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee in a safe, economic, and environmentally-sound manner. *(Program Goal 1)*

Support a competitive process to begin work to establish a depleted uranium hexafluoride conversion capability. *(Program Goal 2)*

Prudently manage the Department's surplus inventory of uranium, including Russian natural uranium transferred to the Department from USEC as required by the USEC Privatization Act and purchase agreement pursuant to P.L.105-277. *(Program Goal 3)*

Program Objectives

Manage all highly enriched uranium oxides removed from the gaseous diffusion plants, and manage the collection and disposal of PCB spills at the leased gaseous diffusion plants and maintain the non-leased facilities in a safe and environmentally-sound condition. *(Program Objective 1 supports Program Goal 1)*

Manage the pre-existing liabilities incurred before the creation of USEC in 1993, as well as, to manage the additional liabilities transferred to the Department resulting from the MOA dated April 6, 1998, after the privatization of USEC. *(Program Objective 2 supports Program Goal 1)*

Support a competitive process to establish a depleted uranium hexafluoride conversion capability. *(Program Objective 3 supports Program Goal 2)*

Manage the DUF_6 storage cylinders and other surplus uranium inventories in an environmentally responsible manner by conducting annual cylinder inspections, developing and implementing options to repair cylinders exhibiting accelerated corrosion, and maintain cylinder yards. *(Program Objective 4 supports Program Goal 3)*

Performance Measures

Meet all legal commitments for post-retirement life and medical costs for retirees who supported the Uranium Enrichment Program before July 1, 1993 and after privatization. *(Supports Program Objective 2)*

Maintain compliance with the Toxic Substances Control Act (TSCA), the Uranium Enrichment TSCA Federal Facilities Compliance Agreement (FFCA), DOE orders and other requirements, and perform minimal corrective maintenance and inspections. *(Supports Program Objective 1)*

In FY 2001, initiate procurement to convert the Department's DUF_6 inventories. *(Supports Program Objective 3)*

Meet legal obligations to the Ohio Environmental Protection Agency and the Tennessee Department of Environment and Conservation, and commitments to the Defense Nuclear Facilities Safety Board to ensure the safety of the Department's inventory of UF_6. *(Supports Program Objective 4)*

Significant Accomplishments And Program Shifts

In FY 1999, Department submitted its plan to Congress for applying the $66 million received from USEC under two Memoranda of Agreements (MOAs). The first MOA in the amount of $16 million was for USEC's obligation for all costs associated with the storage of the depleted uranium generated by USEC during the pre-privatization period. The second MOA in the amount of $50 million provided funding for management of post privatization generated cylinders.

P.L. 105-204, required the Secretary of Energy to develop a plan and proposed legislation for the disposition of DUF_6 and for the construction of, beginning no later than January 31, 2004, facilities at Paducah and Portsmouth to treat and recycle depleted uranium hexafluoride consistent with the National Environmental Policy Act. The final version of the Department's DUF_6 Plan was issued on July 6, 1999.

On July 30, 1999, the Department issued an initial Draft RFP for the DUF_6 conversion facilities.

The final Programmatic Environmental Impact Statement (PEIS) on the long-term management of the Department's depleted uranium was issued on April 16, 1999. The Record of Decision (ROD) was signed by the Secretary on August 2, 1999.

In the latter part of FY 1999, a DOE Independent Investigation of Environment, Safety and Health issues at the Paducah Gaseous Diffusion Plant was conducted. The Department developed and implemented a Corrective Action Plan to resolve these issues. Two major actions included

resolution of criticality safety deficiencies in the DOE Material Storage Areas (DMSAs), and improving oversight of contractor activities by increasing federal staff responsible for oversight and establishing formal, regularly scheduled performance reviews to ensure contractor implementation of DOE and regulatory requirements.

In FY 1999, the Department completed its purchase of Russian natural uranium associated with the natural uranium component of low enriched uranium deliveries under the HEU Agreement. Consistent with P.L. 105-277 and the U.S./ Russia agreements signed on March 24, 1999, the purchase totaled 11 million kilograms (28 million pounds) at a cost of $325 million.

On December 16, 1999, the Defense Nuclear Facility Safety Board (DNFSB) closed Recommendation 95-1, Improved Safety of Cylinders Containing Depleted Uranium. This recommendation was closed because all implementation plan commitments made by the Department had been completed since 1997, and the Department has continued to manage the activities under a cylinder management plan. The DNFSB noted that they were impressed with the Department's use of the systems engineering process to develop a workable and justifiable cylinder management program.

In FY 2000, identification of the potential presence of transuranic and other contaminants in a portion of the inventory of depleted uranium hexafluoride has prompted the Department to initiate a cylinder sampling program. The final conversion services project RFP will be revised and issued after required DUF_6 characterization data are available.

In FY 2000, begin to address disposal of empty storage cylinders at the Paducah, Portsmouth, and ETTP.

Funding Profile

(dollars in thousands)

	FY 1999 Current Appropriation	FY 2000 Original Appropriation	FY 2000 Adjustments	FY 2000 Current Appropriation	FY 2001 Request
Uranium Programs					
Operation and Maintenance	37,210	43,500	-1,555 [a]	41,945	53,400
Transparency	13,580	0	0	0	0
Total, Uranium Programs	50,790 [b] [c]	43,500	-1,555	41,945	53,400 [d]

[a] Includes contractor travel savings, M&O contractor reduction, general reduction distributed to this program and $0.170 million reprogrammed in FY 1999 to fund additional activities at Paducah and Portsmouth.

[b] Includes $13.58 million for the HEU Transparency Measures program, which transferred to the Office of Nonproliferation and National Security.

[c] Excludes $325 million emergency appropriation (P.L. 105-277) for the purchase of natural uranium associated with 1997 and 1998 deliveries under LEU U.S./Russia HEU purchase agreement; and includes $1.79 million reprogrammed into this account to fund additional activities at Paducah and Portsmouth.

[d] Includes $12 million requested from P.L. 105-204 in addition to $12 million from the USEC memoranda of agreements signed in 1998 to support the Depleted Uranium Hexafluoride Management and Conversion project.

Funding by Site

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Albuquerque Operations Office					
Los Alamos National Laboratory	1,000	0	0	0	0%
Sandia National Laboratory	1,250	0	0	0	0%
Total, Albuquerque Operations Office	2,250	0	0	0	0%
Chicago Operations Office					
Argonne National Laboratory (East)	1,060	150 [a]	150[a]	0	0%
New Brunswick Laboratory	530	0	0	0	0%
Total, Chicago Operations Office	1,590	150	150	0	0%
Nevada Operations Office					
Remote Sensing Laboratory	150	0	0	0	0%
Total, Nevada Operations Office	150	0	0	0	0%
Oakland Operations Office					
Oakland Operations Office	440	0	0	0	0%
Lawrence Livermore National Laboratory	6,065	0	0	0	0%
Total, Oakland Operations Office	6,505	0	0	0	0%
Oak Ridge Operations Office					
Oak Ridge Operations Office	10,339	8,946	11,330	+2,384	+26.6%
Oak Ridge National Laboratory	128	11[a]	0	-11	-100.0%
East Tennessee Technology Park	7,262	5,875	2,270	-3,605	-61.4%
Paducah Gaseous Diffusion Plant	4,356	9,907	17,825	+7,918	+79.9%
Portsmouth Gaseous Diffusion Plant	18,185	16,015	20,925	+4,910	+30.7%
Total, Oak Ridge Operations Office	40,270	40,754	52,350	+11,596	+28.5%
Richland Operations Office					
Richland Operations Office	25	0	0	0	0%
Total, Richland Operations Office	25	0	0	0	0%
Washington Headquarters	0	1,041	900	-141	-13.5%
Total, Uranium Programs	50,790 [b c]	41,945 [d]	53,400 [e]	+11,455	+27.3%

[a] Funding supports activities associated with the Depleted Uranium Hexafluoride Management, Conversion project at both gaseous diffusion plant sites.

[b] Includes $13.58 million for the HEU Transparency Measures program, which transferred to the Office of Nonproliferation and National Security.

[c] Excludes $325 million emergency appropriation (P.L. 105-277) for the purchase of natural uranium associated with 1997 and 1998 deliveries under LEU U.S./Russia HEU purchase agreement; and includes $1.79 million reprogrammed into this account to fund additional activities at Paducah and Portsmouth.

[d] Includes contractor travel savings, M&O contractor reduction, general reduction distributed to this program and $0.170 million reprogrammed in FY 1999 to fund additional activities at Paducah and Portsmouth.

[e] Includes $12 million requested from P.L. 105-204 in addition to $12 million from the USEC memoranda of agreements signed in 1998 to support the Depleted Uranium Hexafluoride Management and Conversion project.

Site Descriptions

Oak Ridge Operations

The Oak Ridge Operations (OR) Office is one of the major Field Offices that supports the U. S. Department of Energy's Nuclear Energy Program Office. OR is responsible for fulfilling DOE's contractual liability with respect to retired management and operating contractor employees of the Paducah and Portsmouth facilities as well as retired power supplier employees, and for representing DOE in litigation activities arising from Uranium Enrichment activities prior to July 1, 1993 and additional liabilities after the privatization in accordance with the MOA dated April 6, 1998. OR also provides support for planning, developing, and executing strategies for the disposition of the DUF_6 inventory. OR will have procurement oversight of the execution of a contract(s) for the DUF_6 conversion facilities at both Gaseous Diffusion Plants (GDPs).

OR manages three sites under Nuclear Energy oversight: the gaseous diffusion plant near Portsmouth, Ohio; the gaseous diffusion plant near Paducah, Kentucky; and the gaseous diffusion plant located in Oak Ridge, Tennessee.

East Tennessee Technology Park

The activities at the East Tennessee Technology Park (ETTP), located in Oak Ridge, Tennessee, include nuclear safety activities required to meet Departmental obligations under the Energy Policy Act of 1992 by assisting the NRC in the preparation of an annual report to Congress on the status of health, safety, and environmental conditions at the Gaseous Diffusion Plants (GDPs); management oversight of the enrichment facilities operations; DUF_6 cylinder maintenance activities including storage of the existing inventory of DUF_6 and other surplus uranium in a safe manner; and the administration of the lease agreement between the Department and the United States Enrichment Corporation (USEC Inc.).

Paducah Gaseous Diffusion Plant

The activities at the Paducah Gaseous Diffusion Plant, located on 3,423 acres near Paducah, Kentucky, include: (1) oversight activities associated with the execution of the DUF_6 cylinder maintenance operations; (2) review and update of Safety Analysis Reports as necessary, and assistance with the preparation of NRC's annual report to Congress; (3) the maintenance of nonleased facilities which includes effort in both active and inactive facilities to protect the safety and health of personnel and the environment as well as biological monitoring activities at the Paducah Gaseous Diffusion Plant; and (4) the Polychlorinated Biphenyls (PCB) Program which includes activities related to achieving and maintaining compliance with the Toxic Substance Control Act of 1976 (TSCA), the Uranium Enrichment TSCA Federal Facilities Compliance Agreement, and DOE Orders and other applicable requirements. Specific PCB activities include oversight of the collection and containment system, management of TSCA regulated PCB spill sites, and management of waste generated from these activities.

Portsmouth Gaseous Diffusion Plant

The activities at the Portsmouth Gaseous Diffusion Plant, located on 3,714 acres near Portsmouth Ohio, include: (1) oversight activities associated with the execution of the DUF_6 cylinder maintenance operations; (2) the highly enriched uranium (HEU) Equipment Shutdown and Inventory Disposition Program which removes all HEU materials (materials with assays greater than 20%) from the Portsmouth site, as well as buffering shut down production equipment for nuclear criticality safety purposes, program and business management, safety authorization basis management, and other technical support associated with HEU material; (3) review and update Safety Analysis Reports as necessary, and assistance with the preparation of Nuclear Regulatory Commission's (NRC) annual report to Congress; (4) the maintenance of nonleased facilities which includes effort in both active and inactive facilities to protect the safety and health of personnel and the environment of nonleased facilities at the Portsmouth Gaseous Diffusion Plant; and (5) the PCB Program which includes activities related to achieving and maintaining compliance with Toxic Substance Control Act of 1976 (TSCA), the Uranium Enrichment TSCA Federal Facilities Compliance Agreement, and DOE Orders and other applicable requirements. Specific PCB activities include oversight of the collection and containment system, management of TSCA regulated PCB spill sites, and management of waste generated from these activities.

Argonne National Laboratory

Argonne National Laboratory, through its offices at 9700 S. Cass Avenue, Argonne, Illinois, and at 955 L`Enfant Plaza, Washington, D.C., provides scientific and engineering expertise to the U.S. Department of Energy, Office of Depleted Uranium Hexafluoride Management related to management of DUF_6 program, supports nuclear energy efforts to meet the requirements of the Toxic Substance Control Act (TSCA) and the Federal Facility Compliance Agreement (FFCA) pertaining to operations at the gaseous diffusion plants (GDPs), and provides information management and stakeholder communication services to the Depleted Uranium Management Program. Specifically, they maintain a website that informs the public about depleted uranium and program activities and they maintain and operate an electronic messaging service that provides program updates and announcements to stakeholders.

Oak Ridge National Laboratory

Oak Ridge National Laboratory is located in Oak Ridge, Tennessee and provides scientific and engineering expertise related to management of depleted uranium. Areas of expertise provided are: engineering and cost evaluations of options for storage and use of the DUF_6 inventory; support of examines the environmental, health, safety and socioeconomic impacts of alternative management strategies for the DUF_6 inventory; examines potential uses of materials derived from DUF_6 that can provide an overall economic benefit to the Government.

Operation and Maintenance

Mission Supporting Goals and Objectives

Uranium Programs activities are primarily focused on accomplishing three major goals:

The first goal is to manage facilities not leased by the USEC in a safe, economic, and environmentally-sound manner. Uranium Programs activities at the gaseous diffusion plants in Portsmouth, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee include maintenance of facilities and grounds; remediation of legacy PCB spills; guarding and protecting HEU material stored at the Portsmouth site; paying post-retirement life and medical insurance costs for the retired diffusion site and power supplier personnel; providing legal defense for existing lawsuits; reviewing and updating Safety Analysis Reports (SARs) for the non-leased facilities; and assisting the Nuclear Regulatory Commission (NRC) in preparing annual reports on the safety status of the diffusion plants. Highlights in support of this goal include:

- Consistent with the requirements of the 1992 Energy Policy Act, continue to pay retired employee post-retirement life and medical benefits and legal representation on behalf of DOE for lawsuits against DOE.

- Continue maintenance and surveillance of the shut down HEU equipment.

- In March 3, 1997, the NRC assumed the regulatory authority of the leased gaseous diffusion plants. The Uranium Programs will continue to review and update Safety Analysis Reports (SARs) as necessary for the non-leased facilities, and assist with preparation of NRC's annual report to Congress.

- Continue to perform routine maintenance activities at the non-leased facilities. Activities include safety and health inspections, and corrective maintenance. The program will maintain PCB troughing systems in the process buildings leased to USEC, which involves routine inspections, repairs, spill cleanup and laboratory analysis.

- In response to the DOE Independent Investigation of Environment, Safety and Health Issues at the Paducah Gaseous Diffusion Plant, a Corrective Action Plan was implemented to resolve these issues. Two major actions include resolution of criticality safety deficiencies in the DOE Material Storage Areas (DMSAs), and improving oversight of contractor activities by increasing federal staff responsible for oversight and establishing formal, regularly scheduled performance reviews to ensure contractor implementation of DOE and regulatory requirements.

The second goal is to ensure that the Department's inventories of DUF_6 and surplus uranium are maintained in an environmentally-responsible manner by conducting annual inspections and exploring options to effectively treat cylinders that exhibit accelerated corrosion. In FY 1999, the Department completed an environmental impact statement on the long-term management of its inventory of DUF_6 and issued the record of decision (ROD). In addition, the Department issued the Final Plan in support of

requirements of P.L.105-204, in July 1999 that incorporates applying funding from the $66 million of the Memoranda of Agreement from USEC.

The DUF_6 cylinder management program maintains the current DOE-generated DUF_6 inventory to assure safe storage. Cylinder management involves the general maintenance and monitoring of approximately 57,600 DUF_6 storage cylinders, including such activities as:

- Annually inspect DUF_6 cylinders, repair defective cylinder valves as required, maintain operations procedures, and maintain cylinder-related information data bases (including inspection data). Develop additional technologies to determine cylinder wall condition.

- Relocate DUF_6 storage cylinders to permit 100 percent visual inspection and ultrasonic inspection and procure concrete bases on which to place cylinders.

- Continue the control of cylinder corrosion by surface cleaning and painting.

- Maintain the cylinder storage yards.

The final *Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (PEIS) was issued on April 16, 1999. The preferred alternative in the PEIS is to begin conversion of the depleted uranium hexafluoride inventory as soon as possible, either to uranium oxide, uranium metal, or a combination of both. The Department believes that it is good management practice to proceed toward conversion in a cost effective manner, consistent with overall budget priorities. The *Record of Decision* (ROD) for the proposed action was signed by the Secretary on August 2, 1999.

The Department's Final Plan details a program using the private industry to begin construction of two DUF_6 conversion facilities at the Gaseous Diffusion Plants sites. The program encompasses the following elements: 1) cylinder surveillance and maintenance; 2) conversion services that include the design, construction, operation and decontamination and decommission of the conversion facilities; 3) interim storage of conversion products; 4) use of conversion end products and 5) disposal of end products not used. The Department received $5.0 million in appropriations to conduct NEPA and procurement activities in FY 2000. In addition, Public Law 105-204 identified approximately $373 million by USEC for the disposition of DUF_6. The Department is currently working with Congress to seek access to these funds to support the DUF_6 conversion capability.

Finally, the Uranium Programs manages the Department's surplus inventory of uranium. This involves the storage of the material and supporting the Secretary of Energy's determinations with regard to the sale of surplus Departmental uranium. When sales are authorized, they are accomplished in a manner which will: maximize the return to the United States government; ensure such sales meet the USEC Privatization Act; and do not have an adverse material impact on commercial domestic nuclear fuels industries.

Funding Schedule

(dollars in thousands)

	FY 1999	FY 2000	FY 2001	$ Change	% Change
Highly Enriched Uranium Equipment Shutdown and Inventory Disposition	13,112 [a]	3,700	3,700	0	0%
Maintenance of Leased and Non-Leased Facilities Including Corrective Actions and Nuclear Safety	9,245	10,564	8,870	-1,694	-16.0%
Pre-existing Liabilities	6,957 [b]	8,946	11,330	+2,384	+26.6%
Depleted Uranium Hexafluoride Cylinders and Maintenance	7,896	12,694	16,600	+3,906	+30.8%
Depleted Uranium Hexafluoride Conversion Project [c]	0	6,014	12,877	+6,863	+114.1%
Transparency Measures [d]	13,580	0	0	0	0%
SBIR	0	27	23	-4	-14.8%
Total, Operation and Maintenance	50,790 [e]	41,945 [f]	53,400	+11,455	+27.3%

[a] Excludes $8.0 million in prior year balances.

[b] Excludes $2.55 million of prior year balances.

[c] Includes $5.0 million appropriated in FY 2000 and $12.0 million requested in FY 2001 from P.L. 105-204. FY 2001 excludes $12 million from the USEC memoranda of agreements signed in 1998 to support the Depleted Uranium Hexafluoride Management and Conversion project.

[d] $13.58 million for the HEU Transparency Measures program, which transferred to the Office of Nonproliferation and National Security.

[e] Excludes $325 million emergency appropriation (P.L. 105-277) for the purchase of natural uranium associated with 1997 and 1998 deliveries under LEU U.S./Russia HEU purchase agreement; and includes $1.79 million reprogrammed into this account to fund additional activities at Paducah and Portsmouth.

[f] Includes contractor travel savings, M&O contractor reduction, general reduction distributed to this program and $0.170 million reprogrammed in FY 1999 to fund additional activities at Paducah and Portsmouth.

Detailed Program Justification

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Highly Enriched Uranium Equipment Shutdown and Inventory Disposition			
# Continue residual safeguards and security services in one building as most of the HEU material is removed from building X-326	8,849	2,420	2,420
# Continue surveillance and maintenance activities associated with the 158 permanently shut down cells in the HEU building X-326	812	761	761
# Power and utilities costs required for the 158 shutdown cells in X-326	2,571	281	281
# Continue limited oversight and management of the HEU removal program	880	238	238
Total, Highly Enriched Uranium Equipment Shutdown and Inventory Disposition	13,112 [a]	3,700	3,700

[a] Excludes $8.0 million of prior year balances.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Maintenance of Leased and Non-Leased Facilities Including Corrective Actions and Nuclear Safety			
# Continue management of PCB activities associated with maintaining compliance with the Toxic Substance Control Act (TSCA), the Uranium Enrichment TSCA Federal Facilities Compliance Agreement (FFCA), DOE orders and other requirements	4,102	3,200	3,405
# Sustain minimal corrective maintenance and inspection of 6 active and 29 inactive facilities at the Portsmouth and Paducah sites	3,728	4,693	4,365
# Support for Annual Report to Congress on the status of environmental, safety, and health (ES&H) conditions at the Gaseous Diffusion Plants, as required by the Energy Policy Act of 1992, and the annual Safety Analysis Report (SAR) update for the non-leased facilities	988	1,271	1,100
# Environmental monitoring activities as required by the Kentucky Pollutant Discharge Elimination System (KPDES) including toxicity monitoring for liquid effluents, in-stream monitoring for PCBs in fish, in-stream ecological monitoring of the biotic community, and a small mammals study [a].	427	0	0
# Initiate work associated with characterization and mitigation of the criticality safety deficiencies in the DOE Material Storage Areas (DMSAs)	0	1,400 [b]	0
Total, Maintenance of Leased and Non-Leased Facilities including Corrective Actions and Nuclear Safety	9,245	10,564	8,870

[a] Environmental Monitoring activities were transferred to the Environmental Management Program.

[b] Excludes use of prior year funds.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Pre-Existing Liabilities			
# Contractual liability for Lockheed Martin Energy Systems (LMES) and the Ohio Valley Electric Cooperative (OVEC) post-retirement life and medical expenses for employees with service prior to July 1, 1993 and after April 6, 1998..	5,437 [a]	7,846	9,830
# Outside counsel attorney fees and expenses for seven open class action suits pertaining to unfair labor practices, civil rights/wrongful discharge and other litigation against the Department. The current request excludes funding for a specific suit pertaining to the Paducah Gaseous Diffusion Plant site.	1,520	438	400
# Litigation costs for an on-going class-action suit by persons who live and/or own real property near the Paducah Gaseous Diffusion Plant. The suit unexpectedly entered the discovery phase which has more than doubled in costs.	0	662	1,100
Total, Pre-Existing Liabilities.	6,957[a]	8,946	11,330
Depleted Uranium Hexafluoride Cylinders and Maintenance			
# Relocation of DOE cylinders to improve storage conditions. .	28	70	70
# Personnel, equipment, and materials to recoat DOE cylinders to provide a barrier between the cylinder wall and the moist environment that contributes to the deterioration of the cylinder.	668	2,440	5,293
# Personnel and materials necessary to monitor cylinder and storage yards. Conduct annual inspections, quadrennial inspections, and wall thickness inspections at Paducah, Portsmouth, and Oak Ridge.	1,269	1,200	1,330
# Accelerate disposal activities for DUF_6 empty cylinders. A number of empty cylinders and cylinders with heels are present at the gaseous diffusion plant sites. The cylinders with heels typically have concentrated levels of transuranic materials that are nonvolatile.	0	1,175	2,000

[a] Excludes $2.55 million of prior year balances.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
# Sample DUF_6 tails and heels cylinders to characterize the level of transuranic materials contained in the cylinder. [b]	0	1,050	500
# Management and general maintenance of an estimated 63,000 cylinders which includes the 57,600 of DUF_6 cylinders and other uranium cylinders and 16 cylinder yards at Paducah, Portsmouth and Oak Ridge.	5,556	6,350	6,534
# Materials and personnel performing engineering development work necessary to sustain, optimize and enhance the cylinder storage and maintenance.	247	409	873
# Programmatic Environmental Impact Statement (PEIS).	128	0	0
Total, Depleted Uranium Hexafluoride Cylinders and Maintenance	7,896	12,694	16,600
Depleted Uranium Hexafluoride Management and Conversion Project			
# Implement the Depleted Uranium Hexafluoride Management and Conversion project [b].	0	0	12,000
# Preparation of Request for Proposals for a conversion facility(ies) to meet the schedule in accordance with P.L. 105-204.	0	2,000	0
# Preparation of site specific NEPA activities in accordance with the P.L. 105-204 plan to begin construction of a conversion facility(s) by FY 2004.	0	3,000	0
# Continue research and development on alternative uses of DUF_6 for possible government applications which may reduce the cost of Federal Government programs.	0	1,014	877
Total, Depleted Uranium Hexafluoride Management and Conversion Project	0	6,014	12,877

[a] The sampling program will support the issuance of the Request for Proposals in FY 2001

[b] Assumes that the Office of Nuclear Energy, Science and Technology uses $12 million of the funds provided by USEC under two Memoranda of Agreements between DOE/USEC in FY 2001to begin design of two conversion facilities. The combination of appropriated and MOA funds totals $24 million for contract award.

	(dollars in thousands)		
	FY 1999	FY 2000	FY 2001
Transparency Measures			
# The Transparency Measures program has been transferred from of the Office of Nuclear Energy, Science and Technology to the Office of Nonproliferation and National Security.	13,580	0	0
Small Business Innovative Research and Small Business Technology Transfer Programs			
# Small Business Innovative Research and Small Business Technology Transfer Programs.	0	27	23
Total, Operation and Maintenance	50,790 [a]	41,945 [b]	53,400

[a] Excludes $325 million emergency appropriation (P.L. 105-277) for the purchase of natural uranium associated with 1997 and 1998 deliveries under LEU U.S./Russia HEU purchase agreement; and includes $1.79 million reprogrammed into this account to fund additional activities at Paducah and Portsmouth.

[b] Includes contractor travel savings, M&O contractor reduction, general reduction distributed to this program and $0.170 million reprogrammed in FY 1999 to fund additional activities at Paducah and Portsmouth.

Explanation of Funding Changes from FY 2000 to FY 2001

	FY 2001 vs. FY 2000 ($000)
Maintenance of Leased and Non-Leased Facilities Including Corrective Actions and Nuclear Safety	
# Decrease is the result of down-scope of work activities in the active and inactive facilities area	-1,694
Pre-existing Liabilities	
# Increase is to fund minimum amount required to maintain the Ohio Valley Electric Cooperative post retirement life and medical expenses fund; continue funding outside attorney fees for seven on-going class action suits; and funding for a specific class action suit that unexpectedly went into the discovery phase	2,384
Depleted Uranium Hexafluoride Cylinders and Maintenance	
# Increase is primarily for additional painting of cylinders and disposal of empty cylinders	3,906
Depleted Uranium Hexafluoride Management and Conversion Project	
# Increase for the Depleted Uranium Hexafluoride Management and Conversion project is to support implementation of the project in FY 2001.	6,863
Small Business Innovative Research and Small Business Technology Transfer Programs	-4
Total Funding Change, Operation and Maintenance	11,455