DOE/EV-0031

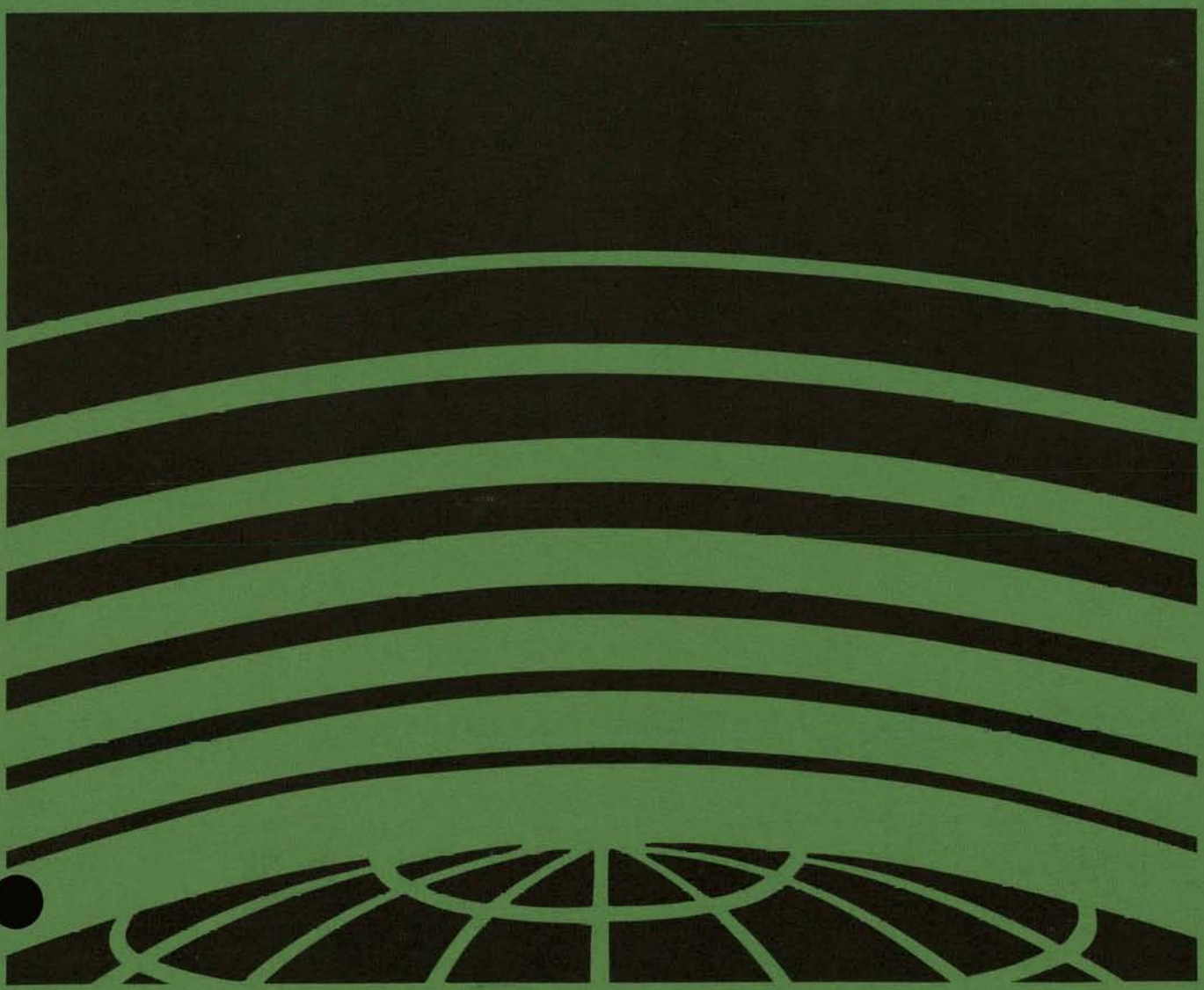
U.S. Department of Energy

Dr 2350

Assistant Secretary for Environment
Division of Environmental Control Technology

Environmental Control Technology Activities of the Department of Energy in FY 1978

March 1979



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Assistant Secretary for Environment
Division of Environmental Control Technology
Washington, D.C. 20545

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PREFACE

This survey, sponsored by the Division of Environmental Control Technology (ECT) within the Office of the Assistant Secretary for Environment, covers environmental control activities carried out in FY 1978 by the Department of Energy (DOE). The environmental control activities for FY 1977 (as compiled by ECT) were defined in DOE/EV-0030, "Environmental Control Technology Activities of the Department of Energy in FY 1977," dated November 1977. All of the inputs to the FY 1977 report were based upon activities of the Energy Research and Development Administration, which was incorporated into DOE. This report and future annual reports will document all DOE environmental control activities associated with the DOE energy technology projects.

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I. BACKGROUND

The Department of Energy (DOE) is responsible for the research, development, and demonstration (RD&D) of existing and emerging energy technologies and the promotion of energy conservation in the Nation. A significant part of that responsibility includes the balancing of energy development goals with environmental requirements to protect and enhance the Nation's general health, safety, and welfare. This necessitates the inclusion of environmental and safety controls as an integral part of energy systems RD&D to ensure that environmental effects are considered and mitigating measures are taken as required.

The Division of Environmental Control Technology (ECT) under the Assistant Secretary for Environment (ASEV) is responsible for ensuring, through overview and independent assessment, the timely development of adequate environmental control technology capability with DOE's energy technology RD&D programs. The projects directly under the cognizance of ECT are primarily focused on overview and independent assessments designed to provide this assurance and to help establish the RD&D requirements for environmental controls. The energy technology offices have the direct responsibility for the conduct of RD&D of environmental control efforts integral to and in phase with their respective energy technology RD&D programs to ensure environmental acceptability of the energy technology at commercialization.

This survey of environmental control technology activities was originally initiated in FY 1977 by the Administrator, Energy Research and Development Administration (ERDA), and published as DOE/EV-0030, "Environmental Control Technology Activities of the Department of Energy in FY 1977," dated November 1977. The Secretary of Energy reaffirmed the need for a continued survey of all DOE environmental control technology activities ongoing in FY 1978 to completely and concisely define those activities and the associated funding. This FY 1978 compilation of total DOE environmental control technology activities, and associated funding, identifies the resources committed by DOE in support of its objective to protect and enhance the general health, safety, and welfare of the Nation concurrent with its research, development, and demonstration of required energy systems.

II. PURPOSE

The primary purpose of this report is to continue to identify and catalog DOE's environmental control activities conducted in support of developing environmentally acceptable energy technologies. Because environmental control technology is an integral part of the DOE energy technology RD&D effort, the total program activity in this area is not immediately identifiable. This survey provides visibility into the total DOE environmental control activity for use by councils of government, other agencies, and the private sector. It is useful to explicitly identify actual DOE efforts in this area to provide a basis for establishing future needs and requirements. This report provides a reference source to be used for future environmental control planning within DOE and to serve as a reference base from which related activities outside of DOE may be evaluated and compared.

As the second in a series of annual reports on environmental control technology activities within DOE, this report may serve as a basis for evaluating program progress. The report presents background material that contributes to the capability to evaluate and assess the environmental control accomplishments, issues, gaps, and overlaps associated with energy development within DOE, in conjunction with other agencies, and in the private sector. A measure of the change in emphasis in the environmental control technology activities within DOE is also presented, indicating shifts, if any, in funding levels for each of the energy technologies.

III. SUMMARY

The total DOE FY 1978 funding allocation related to environmental control activities, as shown in Table 3-1, was $294,066,000, which corresponds to 3.3 percent of the total FY 1978 DOE budget. This respresents an increase of $109,383,000 from the FY 1977 funding for environmental control activities as reported in DOE/EV-0030, "Environmental Control Technology Activities of the Department of Energy in FY 1977," dated November 1977. However, the DOE budget increased from FY 1977 to FY 1978, resulting in a net change in the proportion of funding related to environmental control technology activities of -0.1 percent, essentially no change.

The distribution of the $294,066,000 by energy technology category (independent of intra-DOE organizational structure) is depicted in Figure 3-1. Figure 3-2 shows the distribution, by administrative office, of the total DOE FY 1978 funding allocation related to environmental control activities. As shown in Figure 3-1, fossil and nuclear energy technologies accounted for 90 percent of the total (26 and 64 percent, respectively). In FY 1977, fossil and nuclear energy accounted for a similar amount (88 percent), although the split was different: 50 percent for fossil and 38 percent for nuclear. The majority of the fossil energy related activities, as in FY 1977, were again related to the coal program. Similarly, waste management activities demanded the majority of the nuclear energy funds related to environmental control technology. Conservation and geothermal made up 4 and 3 percent, respectively, of the total. The remaining portion of the total consisted of solar (2 percent), basic energy sciences (1 percent), and magnetic fusion energy (< 1 percent).

Table 3-2 presents the funding breakdown for conservation energy. As shown in Figure 3-3, 46 percent of the funding was associated with buildings and community systems. This work was mainly directed at waste heat reduction, indoor air quality research, and water pollution control.

Fossil energy funding allocations are shown in Table 3-3. The associated distribution of funding is depicted in Figure 3-4 and consists of three main budget categories: (a) coal, (b) petroleum and natural gas, and (c) in situ coal gasification, with the coal subprogram making up the majority (95 percent). A breakdown of the elements is presented in Table 3-4. As shown in Figure 3-5, the coal program activities associated with liquefaction, gasification, and direct combustion made up 83 percent (26, 20, and 37 percent, respectively) of the total coal program funding related to environmental control activities. The remaining 17 percent was related to mining research (9 percent), advanced research (7 percent), and advanced power systems (1 percent). In FY 1978, the associated funding for demonstration plants (liquefaction and gasification) was incorporated into

their respective categories instead of separately summarized as in FY 1977. In addition, the oil shale projects were integrated into the petroleum and natural gas and gasification subprogram. The distribution within the petroleum and natural gas subprogram is shown in Figure 3-6.

Nuclear energy summary funding data are presented in Table 3-5. As shown therein and in Figure 3-7, the majority of the funding related to environmental control activities was in the area of waste management (90 percent), including both commercial and defense waste management.

In the solar energy technology area, solar electric applications programs accounted for 84 percent of the total funding applicable to environmental control technology (Table 3-6 and Figure 3-8). Within that group, the main efforts were focused on the utilization of wind power to generate electricity from solar energy and to analyze the health and safety aspects.

Geothermal energy associated funding remained basically constant from the FY 1977 level (Table 3-7). As in FY 1977, the majority of the geothermal energy activities related to environmental control technology were in the areas of H_2S control, subsidence control, drilling technology, resource exploration, and hydrothermal technology applications.

Basic energy sciences projects related to environmental control technology increased from FY 1977 (Table 3-8). However, the portion related to the total DOE effort remained at slightly less than 1 percent. The main topics of scientific research associated with environmental control technology are in the areas of air pollution control, actinide chemistry, and recovery of metals from fly ash.

Magnetic fusion energy projects related to environmental control technology increased from FY 1977, as shown in Table 3-9. Of the total $1,335,000, most of the magnetic fusion energy environmental control related projects were in the area of development and technology ($1,160,000), the remainder ($175,000) being in the area of technical projects.

In the environment and safety area, managed by ASEV, all of the activities related to environmental control were in the Division of Environmental Control Technology. The environment and safety funding data are shown in Table 3-10. Figure 3-9 depicts the apportionment of that funding with almost equal division between the overview and assessment (O&A) budget category (48 percent) and the decontamination and decommissioning (D&D) budget category (52 percent). For O&A, the funding data are shown in Table 3-11 to be $15,056,000. Figure 3-10 depicts the breakdown of that funding and shows fossil (57 percent) and nuclear (38 percent) energy having the main emphasis (95 percent). The primary areas were in support of the independent overview and assessment of coal gasification projects for air, water, and solids pollution control and in

the evaluation of the environmental impacts of liquefied natural gas and oil spills. In the nuclear area, the independent overview and assessment activities were almost equally divided between the nuclear fuel cycle and materials transportation. As shown in Table 3-12, the funding for D&D was $16,474,000. The D&D efforts, shown in Figure 3-11, were mainly in the area of management of surplus facilities (79 percent) and included surveillance, disposition methods R&D, disposition planning, and actual disposition of surplus facilities. The remaining 21 percent of D&D activities related to the remedial action programs being conducted for formerly utilized Manhattan Engineer District (MED)/Atomic Energy Commission (AEC) sites, inactive uranium mill tailings sites, and at Grand Junction, Colorado.

Table 3-1. Total DOE Environmental Control Activities Funding Allocations

Energy-Related Activities	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands) ***	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Conservation	10,494 (331)	2.2
Fossil Energy	76,519 (8,489)	12.4
Nuclear Energy	189,299 (22,219)	6.5
Solar	4,520 (205)	2.0
Geothermal	9,028 (286)	11.0
Basic Energy Sciences	2,871	1.7
Magnetic Fusion Energy	1,335	0.5
Total	294,066**	3.3**

Total DOE FY 1978 Budget: $8,822,000,000

* To nearest tenth of a percent
** FY 1977 related values were $184,683,000 and 3.4%.
***Includes FY 1978 funding allocated within the Office of the Assistant Secretary for Environment as denoted (See Tables 3-10 through 3-12 for details).

TOTAL DOE FY 1978 FUNDING
RELATED TO ENVIRONMENTAL CONTROL TECHNOLOGY: $294,066,000

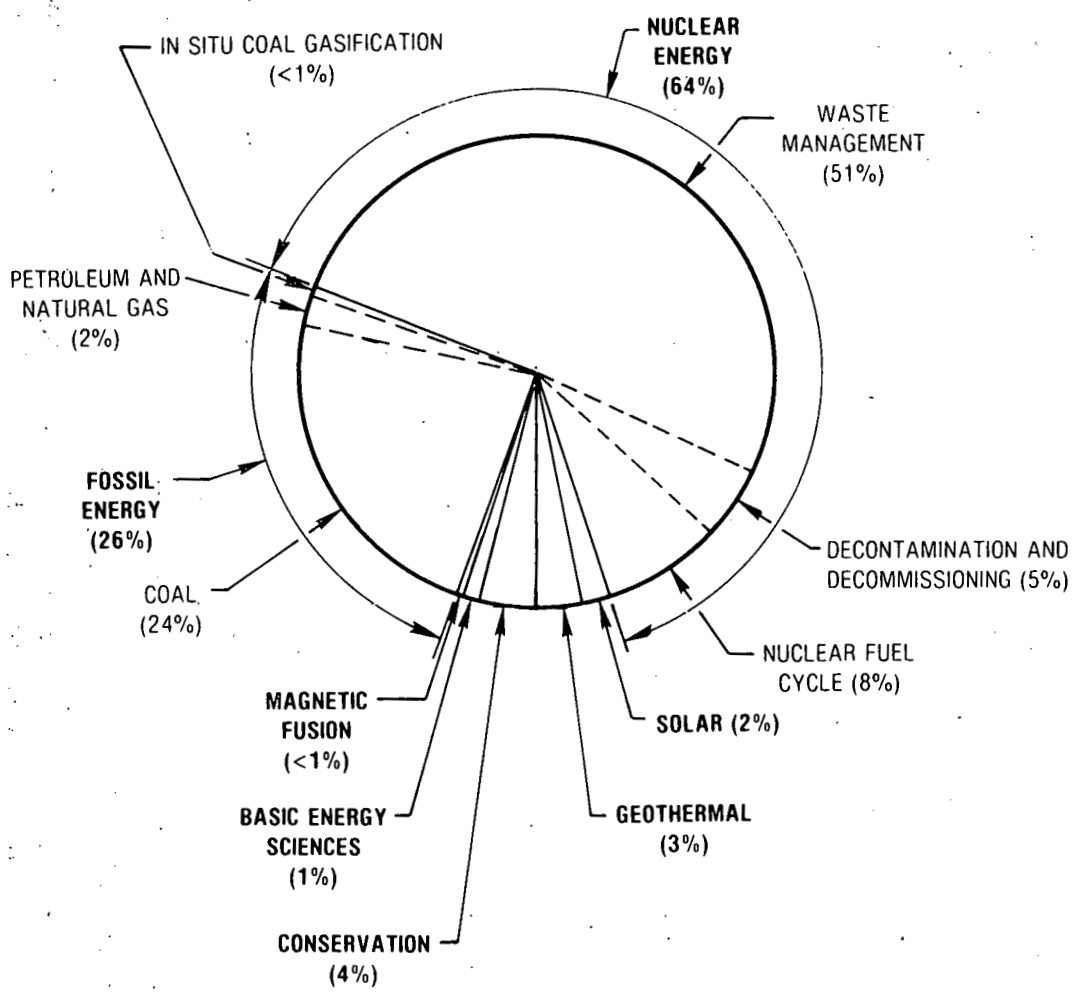

Figure 3-1. Distribution of Total DOE Environmental Control Activities Related to FY 1978 Funding by Energy Category

TOTAL DOE FY 1978 FUNDING
RELATED TO ENVIRONMENTAL CONTROL TECHNOLOGY: $294,066,000

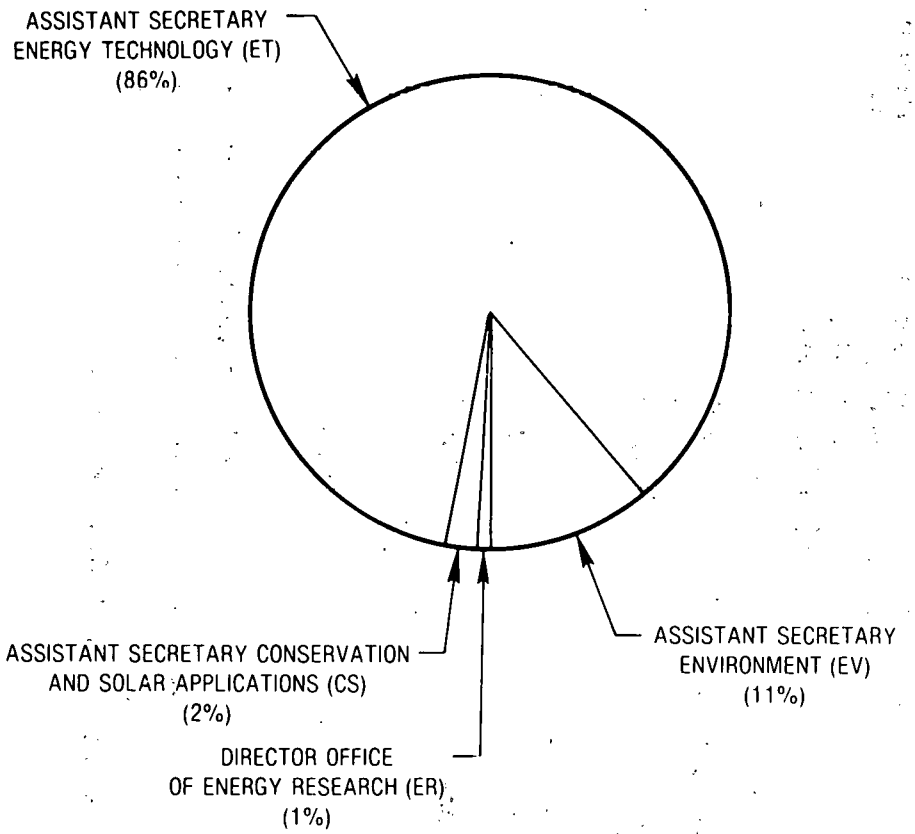

Figure 3-2. Distribution of Total DOE Environment Control Activities Related to FY 1978 Funding by Administrative Office

Table 3-2. Conservation Environmental Control Activities Related Funding

Subprogram	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Buildings and Community Systems	4,650	10.4
Electric Energy Systems	2,764	8.1
Energy Storage Systems	736	1.8
Industrial Energy Conservation	555	2.6
Transportation Applications	1,458	2.9
Total	10,163**	2.1**
	Total Conservation FY 1978 Budget:	$473,500,000

* To nearest tenth of a percent.
** FY 1977 related values were $5,948,000 and 4.8%.

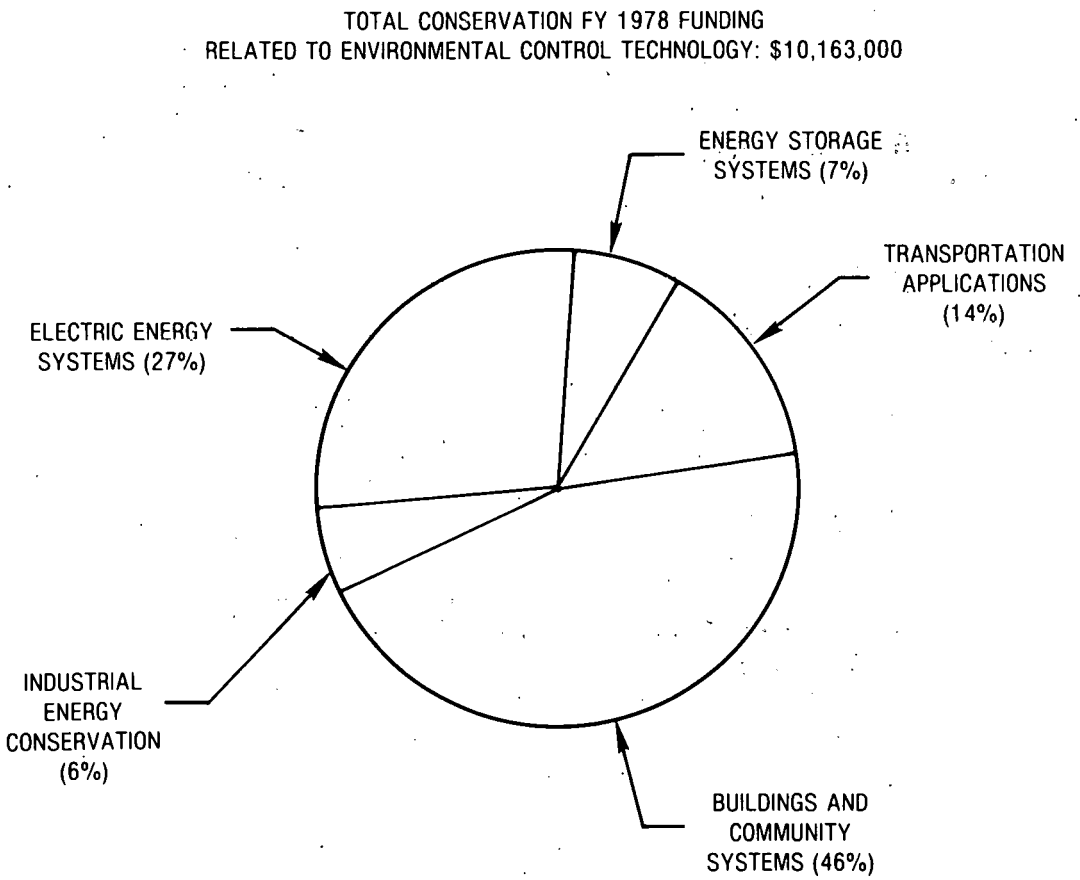

Figure 3-3. Distribution of Environmental Control Technology Funding in the Conservation Energy Technology Program

Table 3-3. Fossil Energy Environmental Control Activities Related Funding

Subprogram	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Coal	65,000	12.5
Petroleum and Natural Gas	1,850	2.1
In Situ Gasification	1,180	8.9
Total	68,030**	11.2**
	Total Fossil Energy FY 1978 Budget:	$609,060,000

* To nearest tenth of a percent.
** FY 1977 related values were $80,194,000 and 17.8%.

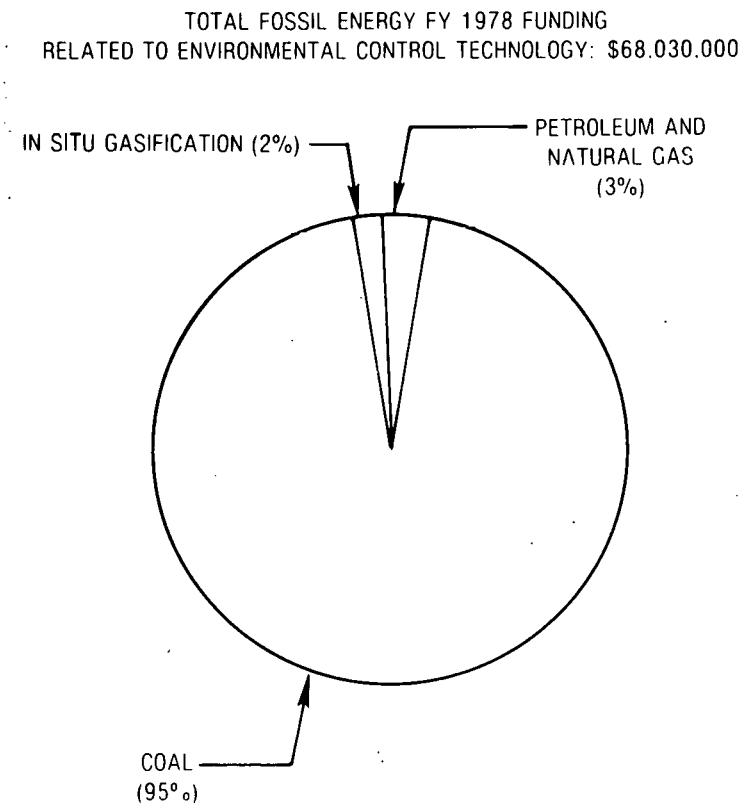

Figure 3-4. Distribution of Environmental Control Technology Funding in the Fossil Energy Technology Program

Table 3-4. Coal Program Environmental Control Activities Related Funding

Subprogram	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Liquefaction	17,070	15.1
Gasification	12,800	8.5
Advanced Power Systems	930	3.9
Direct Combustion	24,100	35.1
Advanced Research and Supporting Technology	4,400	9.2
Magnetohydrodynamics (MHD)	0	0.0
Mining Research	5,700	9.0
Total	65,000**	12.5**
	Total Coal Program FY 1978 Budget:	$520,053,000

* To nearest tenth of a percent.
** FY 1977 related values were $81,897,000 and 20.0%.

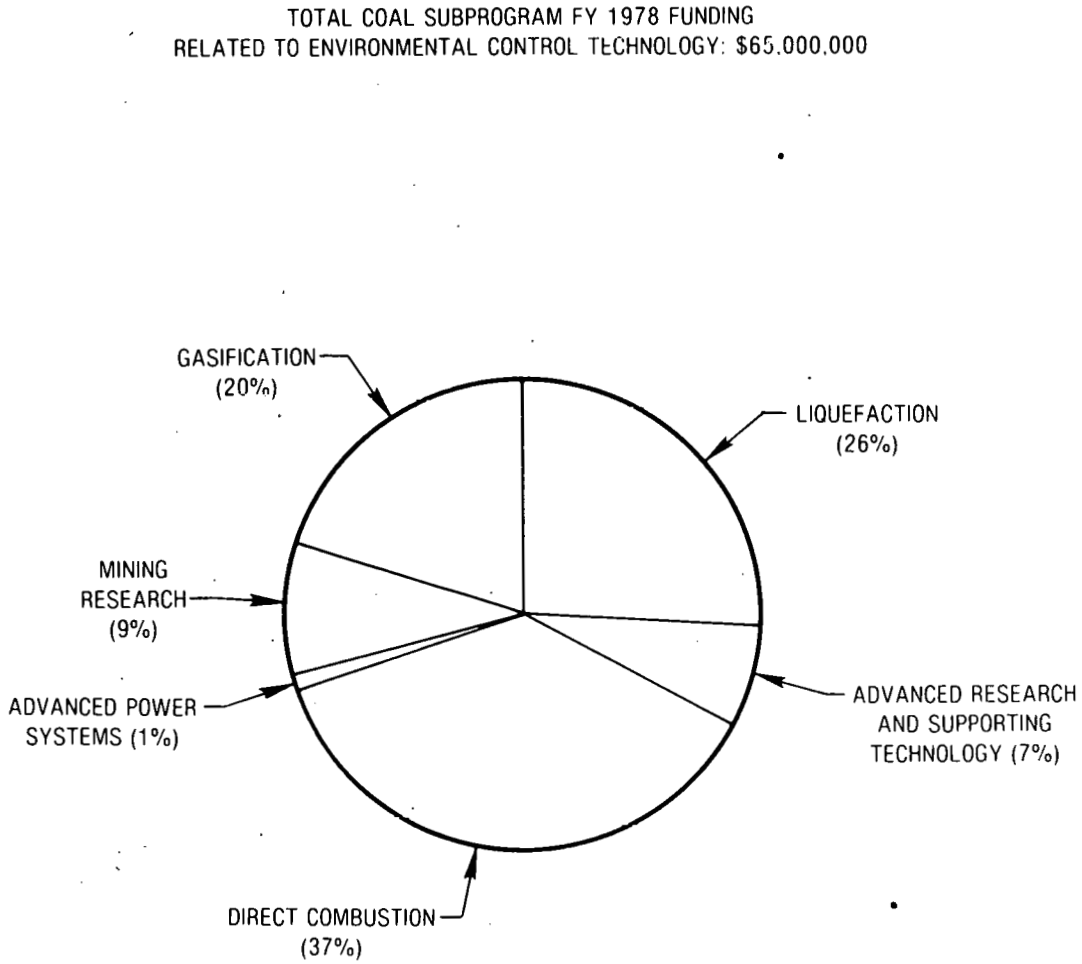

Figure 3-5. Distribution of Environmental Control Technology Funding in the Coal Subprogram of Fossil Energy Technology

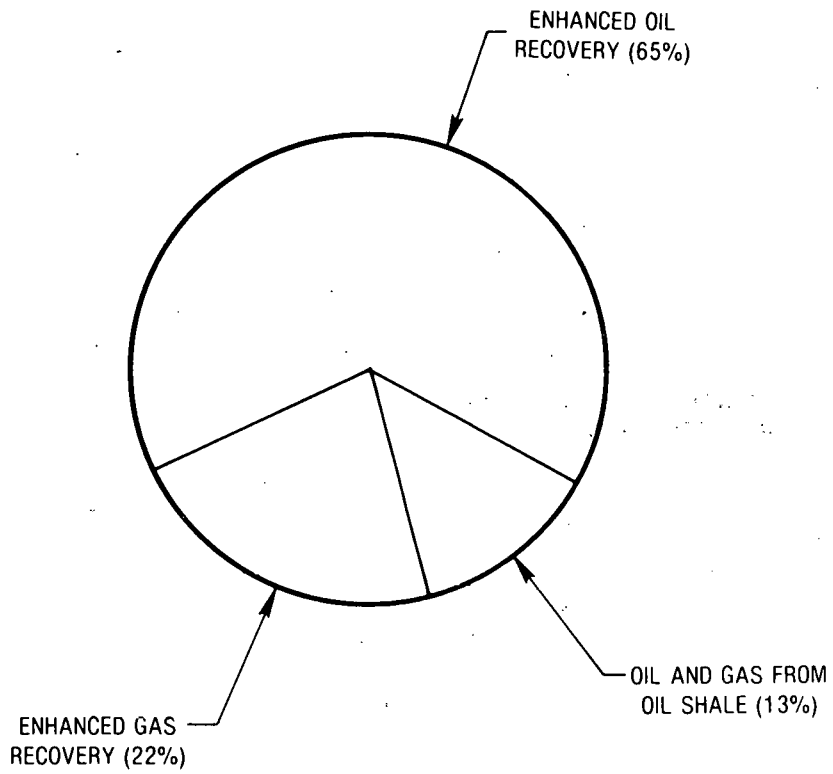

Figure 3-6. Distribution of Environmental Control Technology Funding in the Petroleum and Natural Gas Subprogram of Fossil Energy Technology

Table 3-5. Nuclear Energy Environmental Control Activities Related Funding

Subprogram	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Naval Reactors	0	0
Nuclear Research and Applications	15,458	7.5
Breeder Reactors	1,700	0.3
Uranium Resources and Enrichment	0	0
Waste Management	149,922	63.8
Total	167,080**	5.8**
	Total Nuclear Energy FY 1978 Budget:	$2,883,000,000

* To nearest tenth of a percent.
** FY 1977 related values were $62,195,000 and 2.5%.

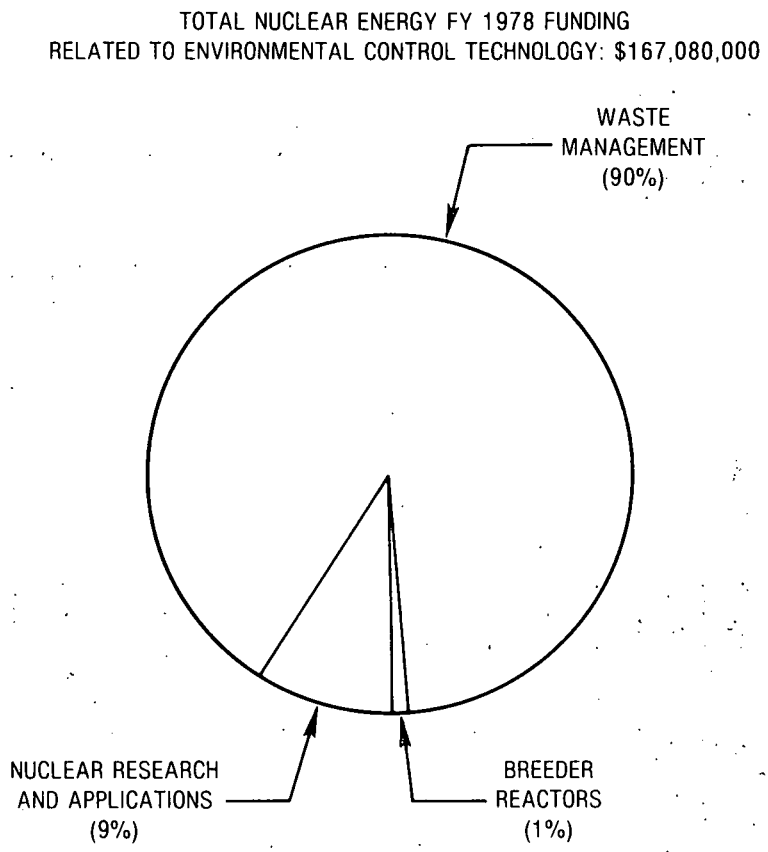

Figure 3-7. Distribution of Environmental Control Technology Funding in the Nuclear Energy Technology Program

Table 3-6. Solar Environmental Control Activities Related Funding

Subprogram	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Thermal Applications	674	1.9
Solar Electric Applications	(3,641)	2.0
Solar Thermal	255	0.3
Photovoltaics	127	0.2
Wind Energy	2,510	9.6
Ocean Thermal	749	3.0
Total	4,315**	1.9**
	Total Solar FY 1978 Budget:	$225,200,000

* To nearest tenth of a percent.
** FY 1977 related values were $2,686,000 and 1.4%.

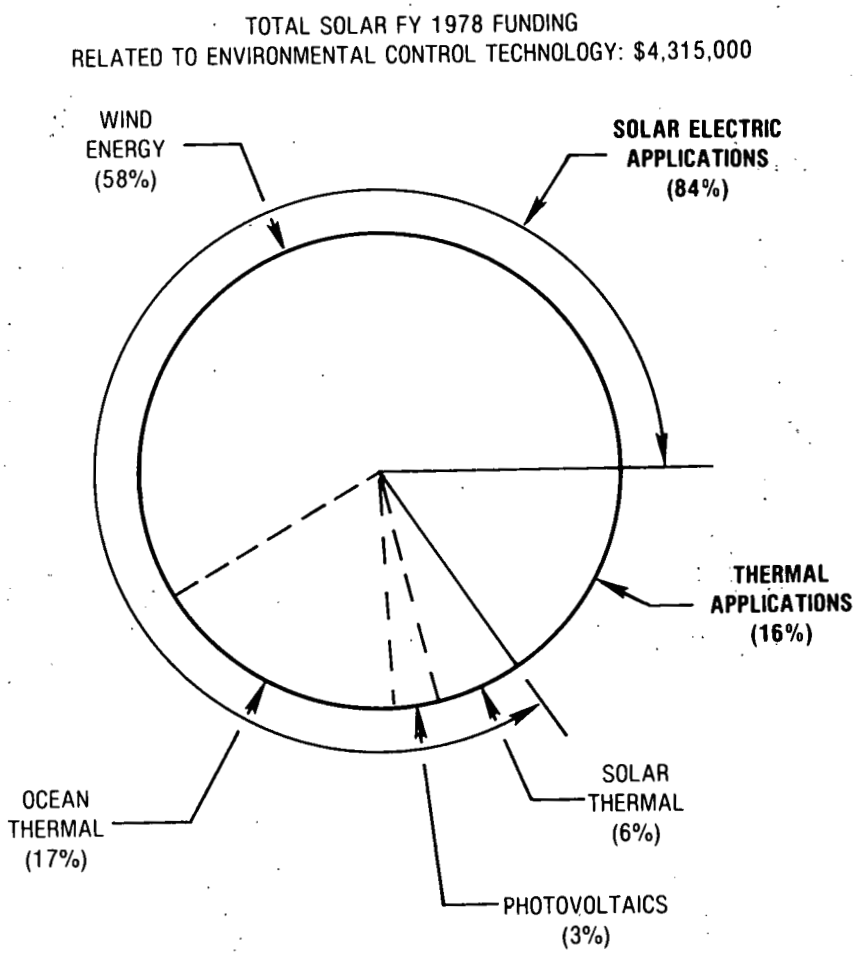

Figure 3-8. Distribution of Environmental Control Technology Funding in the Solar Energy Technology Program

Table 3-7. Geothermal Environmental Control Activities Related Funding

Program	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Geothermal	8,742	10.7
Total	8,742**	10.7**
	Total Geothermal FY 1978 Budget:	$81,900,000

* To nearest tenth of a percent.
** FY 1977 related values were $8,771,000 and 17.9%.

Table 3-8. Basic Energy Sciences Environmental Control Activities Related Funding

Program	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Basic Energy Sciences	2,871	1.7
Total	2,871	1.7
	Total Basic Energy Sciences FY 1978 Budget:	$164,100,000

* To nearest tenth of a percent.

Table 3-9. Magnetic Fusion Environmental Control Activities Related Funding

Subprogram	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Development and Technology	1,160	2.2
Technical Projects	175	0.2
Total	1,335**	0.5**
	Total Magnetic Fusion FY 1978 Budget:	$279,100,000

* To nearest tenth of a percent.
** FY 1977 related values were $780,000 and 0.3%.

Table 3-10. Environment and Safety Environmental Control Activities Related Funding

Subprogram	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Overview and Assessment	15,056	33.6
Biomedical and Environmental Research	0	0
Decontamination and Decommissioning	16,474	100.0
Total	31,530**	14.4**
	Total Environment and Safety FY 1978 Budget:	$219,100,000

* To nearest tenth of a percent.
** FY 1977 related values were $17,973,000 and 8.1%.

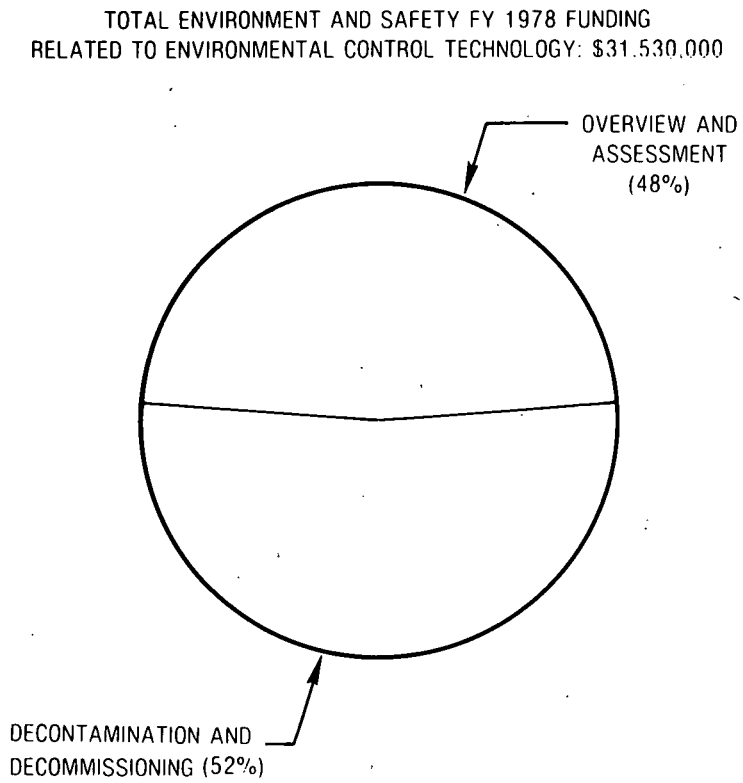

Figure 3-9. Distribution of Environmental Control Technology Funding in the Environment and Safety Program

Table 3-11. Overview and Assessment Breakdown of FY 1978 Funding Related to Environmental Control Activities

Energy-Related Category	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Apportionment of Overview and Assessment FY 1978 Funding for Environmental Control Activities (Percent*)
Conservation	331	2
Fossil Energy	(8,489)	(57)
Coal	5,103	34
Petroleum and Natural Gas	2,936	20
Oil Shale	450	3
Nuclear	(5,745)	(38)
Nuclear Energy	3,390	22
Transportation	2,355	16
Solar	205	1
Geothermal	286	2
Total	15,056	100

* To nearest whole percent.

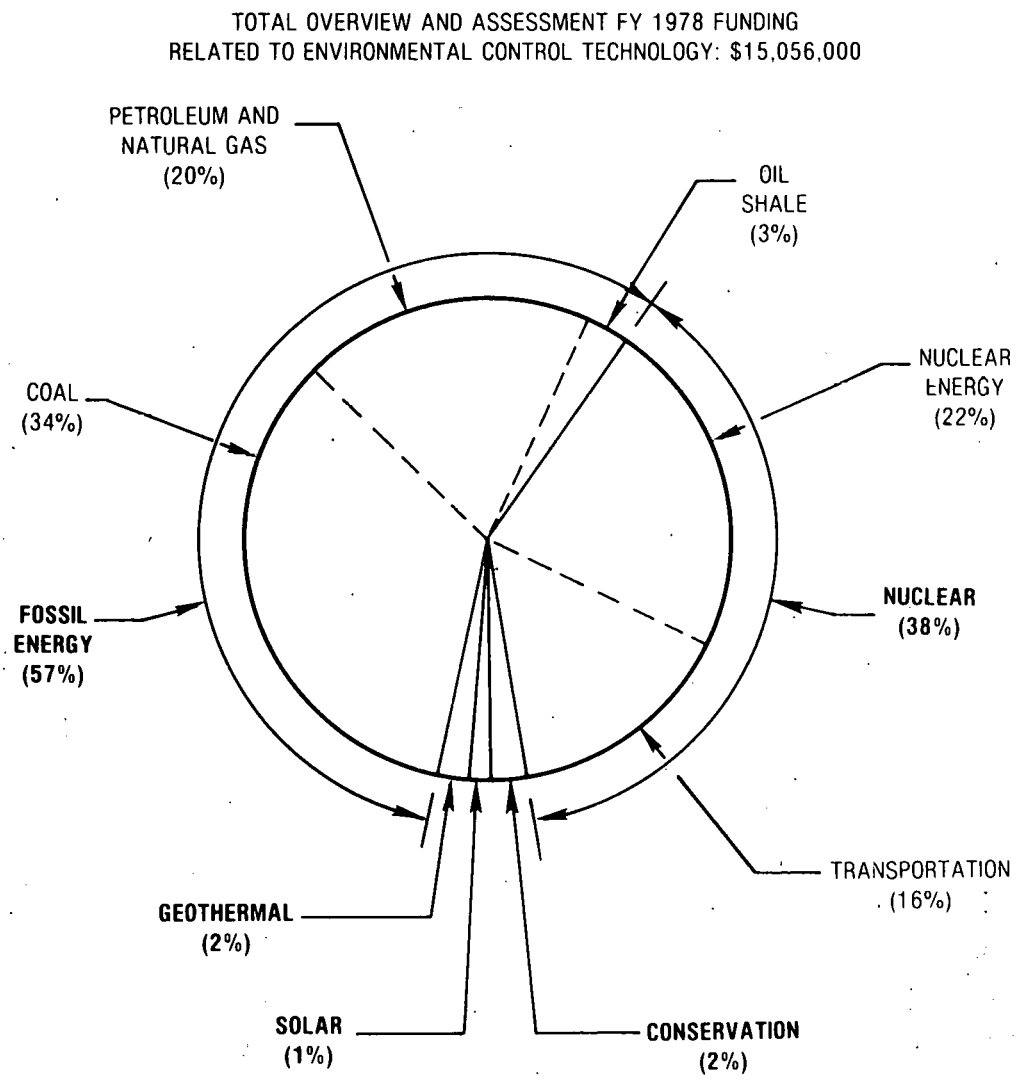

Figure 3-10. Distribution of Environmental Control Technology Funding in the Overview and Assessment Subprogram

Table 3-12. Decontamination and Decommissioning Breakdown of FY 1978 Funding Related to Environmental Control Activities

Subprogram	FY 1978 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1978 Budget Related to Environmental Control Activities (Percent*)
Surveillance	1,053	6
Disposition Methods R&D	800	5
Plans for Disposition of Surplus Facilities	2,634	16
Disposition of Surplus Facilities	8,525	52
Remedial Actions at Inactive Uranium Mill Tailings Sites	411	2
Grand Junction Remedial Action Program	800	5
Formerly Utilized MED/AEC Sites Remedial Action Program (FUSRAP)	2,251	14
Total	16,474	100

* To nearest whole percent.

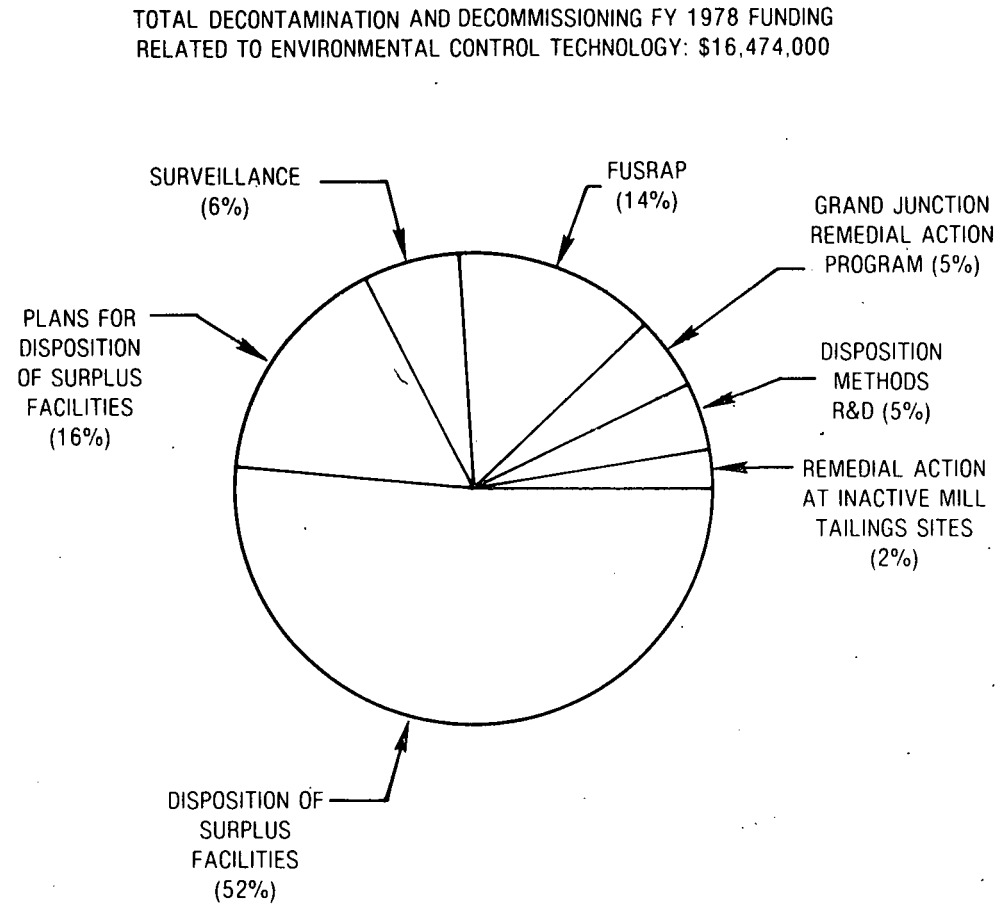

Figure 3-11. Distribution of Environmental Control Technology Funding in the Decontamination and Decommissioning Subprogram

IV. RESULTS

To aid in obtaining the necessary consistent inputs to the survey, specific ground rules and requirements were established. The primary ground rule involved the definition of environmental control, which is:

> Those activities directed at research, development, and demonstration of processes, procedures, systems, subsystems, and strategies which directly or indirectly eliminate, minimize, or mitigate environmental impacts.

Some examples of such activities include:

- Add-on process (e.g., electrostatic precipitator for particulate control);
- Energy process design (e.g., fluidized bed combustion of coal); and
- Energy process "tuning" efforts (e.g., reuse of wastewater).

The criteria for activity applicability to environmental control was as defined in Table 4-1. It was recognized that a clear "black-and-white" set of guidelines was not possible across the board for all energy RD&D programs. Panel sessions were conducted, as necessary, to reconcile the vast majority of applicability uncertainties.

As part of the input requirements, a standardized tabular format was developed. This table, shown in the following sections, provides the following information:

- A heading defining the DOE office involved and the main title for the specific subject.
- "Project/element" title, which is a descriptive title including main words describing the principal nature of the project and element. A "project" was categorized as a discrete, definitely formulated task and an "element" was a division of a program consisting of two or more projects that are technology or subject interrelated.
- A checklist to define the primary categories of the project and element relationship to environmental control technology, such as research, studies, design, etc.

- A description of the relationship of the project or element to environmental control technology. For example, the use of scrubbers, filters, washers, or precipitators to remove noxious gases or particulates from a combustion process.

- The FY 1978 funding allocation related to environmental control technology. Funding was to include operating, capital equipment, and plant budget outlay (B/O) dollars that were determined to be related to environmental control technology.

The following sections describe the detailed inputs obtained.

Table 4-1. Criteria for Applicability to Environmental Control Technology

Category	Applicable	Not Applicable
Major Facilities	RD&D	Energy production operational facilities (e.g., power stations and office space)
Process Design	Environmental impact mitigation	Associated solely with process operations and reliability
Research, Analyses, and Studies	Directly or indirectly necessary to control environmental impact	Do not impact the environment
Assessments	Partially or directly related to determining the need for new or additional environmental controls	To evaluate the characteristics of a process that does not impact the environment
Process Stream Sampling and Analysis	Evaluate or determine the effectiveness and performance of existing or anticipated environmental control provisions	Routine operational monitoring
Training Programs, Seminars, etc.	Related to environmental control	For energy development that is not coincident with environmental control technology

CONSERVATION

Inputs for the conservation energy projects related to environmental control technology were received from divisions within the Offices of the Assistant Secretary for Conservation and Solar Applications (CS) and the Assistant Secretary for Energy Technology (ET). These were buildings and community systems (Table 4-2), transportation energy conservation (Table 4-3), and industrial energy conservation (Table 4-4) from CS and electric energy systems (Table 4-5) and energy storage systems (Table 4-6) from ET.

The total FY 1978 funding related to environmental control technology activities was $10,163,000. Buildings and community systems accounts for 46 percent of that total, mainly due to five projects concerned with waste heat reduction, water pollution control, and indoor air quality research. Electric energy systems follows with 27 percent of the total, primarily in the area of electric field effects of power lines. The remaining portion of the total conservation energy funding is divided among transportation energy conservation (14 percent), energy storage systems (7 percent), and industrial energy conservation (6 percent).

The major projects in the transportation energy conservation area involve electric vehicle safety and advanced combustor concepts. For energy storage systems, the major areas are batteries design and recycling and research into containment materials for hydrogen storage and transportation. The total number of conservation energy projects with environmental control aspects was 65, with transportation energy conservation having the most at 21 and energy storage systems the least at 6.

The conservation energy funding related environmental control technology constituted 2 percent of the total FY 1978 funding. This represents a $4,179,000 increase in the total from FY 1977 even though the percent of the total conservation funding went down from 5 to the present 2 percent. In both FY 1977 and in FY 1978, the funding related to environmental control technology was a relatively low percentage of the total budget, due to the primary objectives of conservation energy, which are promotion of energy conservation, conversion of existing facilities and equipment, and development of new, energy-efficient methodologies and technologies. The first objective involves very little environmental control effort because it is directed toward consumer conservation and not energy development. The last two objectives do involve environmental control, either by providing the same energy services with less energy input (fewer pollutants) or by the development of new techniques that more effectively utilize the available energy potentials. In either case, the control is by design and not as an add-on unit.

Table 4-2. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: *Conservation and Solar Applications*

PANEL SESSION SUBJECT: Buildings and Community Systems

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
COMMUNITY SYSTEMS										
Integrated Systems*			X						Waste Heat Reduction/Other Environmental Impacts Mitigation. 50%	2,700
URBAN WASTE										
NCRR Task Orders*	X				X				Recovery of Waste Material. 15%	40
ANFLOW Process*	X		X			X			Reduction of Water Pollution. 85%	250
Activated Carbon for Sludge Digestion*	X			X					Reduction of Water Pollution. 100%	300
Combined Treatment of Liquid and Solid Waste	X		X						Reduction of Water Pollution/Solid Waste Recovery. 50%	200
ARCHITECTURAL AND ENGINEERING SYSTEMS										
Institutional Building Program*	X	X				X			Indoor Air Quality Research. 33%	1,000
Energy Performance Standards for New Buildings						X			Programmatic EIS. 100%	100
Insulation Testing*	X	X				X			Flammability Studies and Formaldehyde Tests of Urea-formaldehyde Insulation. 18%	52
CONSUMER PRODUCTS AND TECHNOLOGY										
Feasibility Study of Groundwater Source Heat Pump						X			Environmental Assessment of Groundwater Impacts. 5%	7.5
									Total	4,649.5

* Indicates that at least some portion of environmental control activity was funded in FY 77. All funds shown are for FY 78.

NOTES: ANFLOW - Anaerobic Digester using Fluidized Bed Combustion
NCRR - National Center for Resource Reserve

Table 4-3. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Conservation & Solar Applications

PANEL SESSION SUBJECT: Transportation Energy Conservation

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Gas Turbine/Bus Marketing Demonstration								X	Identification of environmental issues to be measured in both revenue and test track operations. 15%	60
Continuously Variable Transmission			X						Identified noise as primary technology restriction; performed redesign to lower hydrostatic module noise. 30%	180
Rankine Bottoming Cycle for Heavy Duty Trucks			X		X				Design and vehicle instrumentation for future emission mapping. 10%	86
Gas Turbine Engines	X	X							Evolution and evaluation of advanced combustor concepts. 50%	200
Stirling Engine		X	X			X			Assessment of Ecological Effects. 5%	80
Turbocompound Diesel Engine Engineering Demonstration					X			X	Assessment of emissions. 10%	40
Investigation of Alcohol/Gasoline Blends	X					X			Assessment of emissions, including unregulated. 80%	80
Characterization of Alcohol/Gasoline Blends						X			Assessment of emissions, including unregulated. 10%	25
Modification of Alcohol Fuels	X								Emissions and toxicological effects. 5%	12
Investigation of Methanol Fuel	X								Emissions and ecological effects. 30%	45
Alcohol Fuels Fleet Data Bank								X	Gathering of emission/environmental data. 15%	6
Design Data for Hydrogen Engine	X								Design influence on emissions. 15%	15
Near Term Electric Vehicle Program	X	X	X	X					Electric Vehicle Safety - crash energy management accident avoidance, non-operating safety. 8%	400
Electric Vehicle Handling Project	X			X	X				Electric Vehicle handling and stability test and measurement. 100%	150

Table 4-3. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Conservation & Solar Applications

PANEL SESSION SUBJECT: Transportation Energy Conservation

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Stratified Charge Retrofit System					X				Emission testing and evaluation. 25%	30
Automotive Microcarburetor					X			X	Emission testing and evaluation. 1%	2
Bottoming Cycle for Pipelines			X			X			Preliminary environmental assessment. 5%	13
Alternative Fuel/Energy for Nonhighway Transport		X				X			Assessment study. 7%	16
Alternative Fuels for Medium Speed Rail and Marine Applications		X		X		X			Assessment study. 3%	3.3
Coal/Oil Slurry Fuel for Marine Steam Turbine		X	X	X					Fuels and Combustion Aspects. 30%	2.5
Bottoming Cycle for Marine Diesels			X		X				Preliminary environmental assessment. 5%	12.5
									Total	1,458.3

Table 4-4. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Conservation and Solar Applications

PANEL SESSION SUBJECT: Industrial Energy Conservation

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Organic Rankine Bottoming		X							Reduced air pollution. 5%	10
High Performance Forge Furnace		X	X						Reduced air pollution. 5%	30
Glass Conglomerates		X							Reduced air pollution. 5%	25
Textile Hyperfiltration		X							Reduced air and water pollution. 5%	15
Pulp Paper - Sludge Drying		X							Reduced water pollution. 5%	7
Aluminum Reduction Cell Cathode		X							Reduced air pollution. 5%	25
Brayton Cycle Glass Industry		X							Reduced air pollution. 5%	150
Polypropylene Waste to Fuel Oil		X							Reduced waste pollution. 5%	5
Cement Kiln/Waste as Fuel		X							Reduced air, water, and solid waste pollution. 5%	15
Glass Composite Pipes		X							Reduced solid waste pollution. 5%	5
Lube Oil Recovery		X							Reduced waste pollution. 5%	25
Cogeneration		X							Reduced air pollution. 5%	100
Moving Beam Furnace		X							Reduced air pollution. 5%	25
Automatic Boiler Fuel Controls		X							Reduced air pollution. 5%	8
Blended Cement		X							Reduced air and solid waste pollution. 5%	5
Heat Recuperators		X							Reduced air pollution. 5%	50
High Temperature Heat Pump		X							Reduced air pollution. 5%	55
									Total	555

Table 4-5. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Electric Energy Systems

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Instrumentation Study for Electrostatic Field Effects	X	X		X					Establish requirements for traceability, etc. for electric field measurement equipment	150
Research to Investigate the Biological Effects of High Voltage Electric Fields	X	X			X	X			Study Biological Effects of High Strength Electric Fields on Small Animals	765
Transmission Line Audible Noise Measurements	X	X	X	X	X	X			Investigate audible noise generated by EHV lines and relate to human response	180
Optimization of Transmission Line Support Systems	X		X	X		X			Minimize environmental impact of new support systems	300
HVDC Test Line - Electric Field Effects of DC Lines	X			X	X	X			Investigate Field Effects of DC Lines	311
DC Biocage Design	X		X	X					Complete experimental design of test enclosures. 50%	100
Animal Study	X	X		X	X	X			Study Electric Field Effects on Animals	456
Study and Determine The Potential Use of Silicone Fluids in Transformers	X	X		X	X	X			Develop alternate insulation fluids safe to personnel and environment	60
Electric Field Survey	X	X			X	X			Determine actual fields associated with transmission lines. 100%	400
Effects of $60H_z$ Fields	X	X	X						Determination of electric field effects on central nervous system. 10%	22
Biomedical Effects of Transmission Systems	X	X	X		X				Determination of field effects on circadian rythmn. 10%	20
									Total	2,764

Table 4-6. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Energy Storage Systems

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Lithium/Sulfur Battery Development	X	X	X			X			Examining recycling possibilities for these batteries, designing thermal insulation and electrical safety features, and vehicle crash safety measures. 4%	200
Sodium/Sulfur Battery Development	X		X		X				Conducting rupture tests and designing measures to prevent the rapid mixing of reactants as well as vehicle crash safety measures. 4%	140
Zinc/Chlorine Battery Development	X		X		X	X			Developing vehicle crash safety designs. 10%	30
Hazard Assessment of Zn/Cl Electric Vehicle Batteries	X	X			X	X			Paper study to define hazards of Cl_2 in Zn/Cl Electric Vehicle Battery	86
Aquifer Storage	X	X				X			Assess the technical, socio-political, and environmental aspects of aquifer storage of heated and chilled water for building space conditioning. 100%	30
Containment Materials for Hydrogen Storage and Transport	X	X	X	X					Conducting research as well as designing and developing containment materials for hydrogen to alleviate the problem of hydrogen embrittlement. 100%	250
									Total	736

FOSSIL ENERGY

Fossil energy environmental control efforts conducted within ET are presented in Tables 4-7 through 4-17. The total FY 1978 fossil energy funding associated with environment control efforts was $68,030,000, which represents approximately 11 percent of the FY 1978 fossil energy budget. Compared to FY 1977, funds for these activities decreased by $18,164,000 and approximately 7 percent of the total budgetary funds.

As was the case in FY 1977, the major portion of the applicable FY 1978 funding (95 percent or $65,000,000) was devoted to the coal program. Within this program, three major areas contributed 83 percent of the $65,000,000: direct combustion (37 percent), liquefaction (26 percent), and gasification (20 percent). In gasification, the majority of the funding associated with environmental control technology was in the area of environmental control research for high- and low-Btu gasification pilot and demonstration plant projects. For liquefaction, the projects associated with solvent extraction accounted for most of the funding in the area of environmental control.

The majority of the direct combustion funding associated with environmental control efforts was associated with fluidized bed combustion related projects. The remaining subprograms within the coal program, in order of funding levels, were mining research ($5,700,000), advanced research and supporting technology ($4,400,000), and advanced power systems ($930,000). Mining research was not within the cognizance of ERDA in FY 1977 but is now incorporated in DOE in FY 1978. In all of these subprograms the primary environmental control emphasis is associated with environmental control laboratory and research, bench scale, and pilot plant projects.

The remaining 5 percent ($3,030,000) of the total fossil energy funding ($68,030,000) related to environmental control technology was within the petroleum and natural gas and in situ coal gasification programs. Laboratory and research projects associated with various means of flooding and thermal recovery were predominant in the enhanced oil and gas recovery subprograms ($1,600,000). Following this, the oil and gas from the oil shale subprogram accounted for $250,000 in environmental control related research. The remaining $1,180,000 was associated with pilot projects in the in situ coal gasification program.

Table 4-7. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Liquefaction

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Direct Hydrogenation	X	X			X	X			Pilots. 12% PDU's. 10% Laboratory & Research Projects. 5%	3,570
Solvent Extraction	X	X	X		X				Pilots. 12% Laboratory & Research Projects. 5%	10,800
Pyrolysis	X	X						X	Laboratory & Research Projects. 5%	30
Support Studies & Engineering Evaluation	X	X		X		X		X	Laboratory & Research Projects. 5%	1,100
Demonstration			X	X					Demos. 2%	1,570
									Total	17,070

Table 4-8. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - High-Btu Gasification

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Hygas Pilot Plant						X		X	Pilot Plant.	700
Bigas Pilot Plant								X	Pilot Plant.	40
Synthane Pilot Plant	X	X			X			X	Laboratory & Research Projects. 5%	
									Pilot Plant.	1,300
									Air Monitoring.	
Hydrogasification	X							X	PDU.	200
Steam Iron Pilot Plant								X	Pilot Plant.	200
General Pilot Plant Support								X	Pilot Plant.	300
Support Studies & Engineering Evaluation	X	X	X		X	X			Laboratory & Research Projects. 5%	1,000
Demonstration	X	X	X			X			Demos. 2%	2,510
									Total	6,250

Table 4-9. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Low-Btu Gasification

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Two Stage Fluidized Bed Gasifier								X	PDU.	100
Tri-Gas Process	X	X						X	Laboratory & Research Projects. 5%	100
Entrained Bed Gasifier								X	Pilot Plant.	200
Combined Cycle Test Facility	X	X		X		X		X	Test Facility.	1,900
Gasifiers in Industry	X	X	X	X		X		X	Laboratory & Research Projects. 5% Industrial Gasifiers.	1,500
Support Studies & Engineering Evaluation	X	X				X		X	Laboratory & Research Projects. 5%	1,000
Demonstration	X	X	X			X			Demos. 2%	1,750
									Total	6,550

Table 4-10. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Advanced Power Systems

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Open Cycle Gas Turbines	X	X						X	Laboratory & Research Projects. 5% Pilot Plants.	675
Closed Cycle Power Systems	X	X						X	Laboratory & Research Projects. 5%	63
Support Studies & Engineering Evaluation	X	X			X	X			Laboratory & Research Projects. 5% Hot Gas Clean-up. 100%	197
									Total	930

Table 4-11. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Direct Combustion

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Fluidized Bed Boiler Atmospheric			X						Fluidized Bed Combustion.	13,568
Pressurized Systems			X						Fluidized Bed Combustion.	8,547
Coal-Oil Slurries	X	X						X	Laboratory & Research Projects. 5%	235
Support Studies & Engineering & Environmental Evaluation	X	X			X	X			Laboratory & Research Projects. 5%	1,750
									Fluidized Bed Combustion.	
									Total	24,100

Table 4-12. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Advanced Research & Supporting Technology

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Coordination						X			Environmental Research. 100%	117
Review and Analysis	X	X						X	Laboratory & Research Projects. 5%	356
Project and Policy Coordination	X	X				X		X	Laboratory & Research Projects. 5%	38
Liquefaction Processes	X	X	X			X			Laboratory & Research Projects. 5 % SRC	504
Gasification Processes	X	X	X			X			Laboratory & Research Projects. 5%	603
Refining/Chemical Processes	X	X	X			X			Laboratory & Research Projects. 5% Environmental Research. 100%	293
Direct Utilization	X	X			X	X			Laboratory & Research Projects. 5% Fluidized Bed Combustion. Environmental Research.	2,197
Materials & Components	X	X	X						Laboratory & Research Projects. 5%	292
									Total	4,400

Table 4-13. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Enhanced Oil Recovery

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Micellar Polymer Flooding	X	X		X					Pilot Projects. 20% Laboratory & Research Projects. 5%	400
CO_2 Flooding	X	X							Environmental Research. Laboratory & Research Projects. 5%	300
Improved Water Flooding	X	X				X			Laboratory & Research Projects. 5%	200
Thermal Recovery	X	X	X		X	X			Environmental Research. Laboratory & Research Projects. 5%	300
									Total	1,200

Table 4-14. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Enhanced Gas Recovery

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Massive Hydraulic Fracturing	X	X						X	Laboratory & Research Projects. 5%	135
Chemical Explosives Fracturing	X	X						X	Laboratory & Research Projects. 5%	50
Deviated Wells	X	X						X	Laboratory & Research Projects. 5%	15
Resource Characterization	X	X						X	Laboratory & Research Projects. 5%	50
Environmental & Other Support Studies	X	X				X		X	Laboratory & Research Projects. 5%	150
									Total	400

Table 4-15. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Mining Research

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Advanced Coal Mining Technology	X	X	X	X		X			Laboratory, Research, and Development Projects.	5,700
									Total	5,700

Table 4-16. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - Oil Shale

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Shale Oil Production	X	X				X		X	Laboratory & Research Projects. 5%	200
									Environmental Research.	50
Gas from Oil Shale	X	X						X	Laboratory & Research Projects. 5%	
									Off-Gas Control & Use.	
									Total	250

Table 4-17. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Fossil - In Situ Coal Gasification

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
In Situ Coal Gasification	X	X		X		X			Pilot Projects.	1,180
									Total	1,180

NUCLEAR ENERGY

The nuclear energy inputs to this survey, received from ET, are contained in Tables 4-18 through 4-20. The total funding associated with environmental control technology was $167,080,000, which is approximatley 6 percent of the total budget. Waste management, commercial and defense, accounted for 90 percent ($149,922,000) of that total, as was the case in FY 1977, with the major projects being the national waste terminal storage program, high level waste (HLW) vitrification, and the radioactive waste demonstration program, as shown in Table 4-20.

Compared to FY 1977, the nuclear energy funding related to environmental control technology increased by $104,885,000 in FY 1978. However, due to increases in the FY 1978 total nuclear energy budget, the ratio of environmental control efforts to the total increased only about 3 percent, to the present 6-percent level.

Table 4-18 lists the nuclear research and applications environmental control activities. These made up 9 percent of the total nuclear energy funding related to environmental control technology ($15,458,000). The projects fall into the categories of particulate emission control, liquid effluent control, nuclear fuel behavior safety studies, and diffusion studies.

Table 4-19 lists the breeder reactor environmental control activities, which made up the remaining 1 percent ($1,700,000) of the total nuclear energy funding related to environmental control technology. The projects are mainly concerned with radioactivity control and atmospheric transport and dispersion studies carried out primarily by the National Oceanic and Atmospheric Administration (NOAA).

Table 4-18. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Nuclear Energy

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Particulate Emission Control (Boilers at Richland, WA)			X	X				X	Particulate Control. 100%	6,500
N-Reactor Environmental Improvements		X	X					X	Liquid effluent control. 100%	7,500
Dry and Wet/Dry Cooling Tower Studies	X	X		X					Effluent control. 100%	200
Environmental Effects of District Heating	X	X				X			Assessment. 100%	25
Meteorological Effects of Thermal Energy Releases*	X	X			X	X			Atmospheric effects of power parks. 100%	648
Environmental Radiation Safety	X	X				X			Nuclear fuel behavior. 33%	40
Advanced Safety Technology	X	X		X		X			Nuclear fuel behavior. 33%	425
Safety Support	X	X				X			Diffusion studies. 33%	120
									Total	15,458

*Jointly funded with EV

Table 4-19. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Nuclear Energy

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Effects of Advanced LMFBR Fuels	X	X			X	X			Alternate fuels assessment. 100%	360
Evaluation of Models for Assessment of LMFBR Radioactivity Releases		X				X			Assessment of dose models. 100%	255
Meteorological Studies - NOAA*	X	X			X				Diffusion Studies. 80%	210
Sodium Combustion Product Depletion**	X	X			X				Transport studies. 100%	50
Radioactivity Control Technology	X	X	X			X			Control of radioactive releases. 100%	825
									Total	1,700

* Joint Funding with NRC which contributes funding equal to DOE's.

** Solar Energy provided $150K in FY 1978.

NOTES:

NOAA - National Oceanic and Atmospheric Administration
NRC - Nuclear Regulatory Commission
LMFBR - Liquid Metal Fast Breeder Reactor

Table 4-20. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Waste Management

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Waste Isolation Pilot Plant	X			X	X	X			Demonstration of TRU (transuranic) waste isolation methodology and operations.	22,000
Fluidized Bed Incineration and Waste Immobilization				X					Development of fluidized bed incinerator for incineration of contaminated radioactive fuel cycle waste	600
Krypton-85 Disposal Program				X					To incorporate Kr-85 disposal into ongoing disposal or storage development programs in mined geological repositories	300
High Efficiency Particulate Air (HEPA) Filter Development and Testing				X					To reduce HEPA filter waste volumes	300
Borehole Geophysics and Radioactive Waste Migration				X					Development of techniques to follow migration of nuclides from waste disposal sites	196
Evaluation of Transuranic Waste (TRU) Contaminated Waste Burial Sites		X		X					Development and application of techniques to aid in evaluating integrity of burial sites	144
DOE TRU-Waste Research, Development, and Demonstration (RD&D) Program	X			X					To provide data for upgrading management methods for TRU waste project	1,506
Radioactive Waste Burial Technology				X					To improve technology related to the land burial of radioactive waste	300
Controlled Air Incineration-Commercial Waste				X					To develop and demonstrate improved waste incineration and assay systems for nuclear waste	320
Encapsulation of Radioactive Waste in Metal				X					To provide technical base to provide physical, chemical and radiolytic stability prior to final disposition	250
Criteria for Hull Treatment				X					To develop criteria for the form of hull waste stream and package required to meet safety and economic considerations	100

Table 4-20. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Waste Management

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Migration of TRU and Fission Products in Lithosphere	X	X							To study the migration behavior of important long-lived nuclear waste products	150
Krypton-85 Storage Development				X					To develop alternate technologies for immobilizing and disposing Kr-85	500
TRU Waste Processing				X					To develop a system to process retrieved TRU waste at INEL	1,110
Solidification				X				X	Involves the calcining of high and intermediate level liquid wastes to granular form	7,000
Defense Waste Management				X					To develop processes for efficient and safe fluid bed solidification of radioactive waste generated at ICPP	520
Long-Term Management of ICPP High-Level Waste				X		X			To develop and assess adequate technology for the long term management of ICPP high-level radioactive waste	2,000
Nevada Test Site (NTS) Terminal Waste Storage Program		X		X		X			To evaluate major geologic formations to determine suitability for locating repository for high-level radioactive waste	8,000
Area 5 Radioactive Waste Disposal								X	The operation of radioactive solid waste burial/storage areas at Nevada Test Site	125
High Level Waste (HLW) Process Tests	X	X		X					Studies of volatile radionuclides associated with the spray calcining process for HLW	187
Removal and Segregation of Radioactive Nuclides from Liquid Waste Streams	X	X		X					Studies involve iodine removal in the nuclear fuel cycle and biological denitrification	739
Waste Management Analysis for Nuclear Fuel Cycles	X	X				X			Studies to assess needs, methodologies and new alternatives for waste management	1,699
Fixation of Wastes in Concrete	X			X					Development work leading to the use of cementitious materials for isolating HLW	490

Table 4-20. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Waste Management

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Study of Ceramic and Cermet Waste Forms	X	X		X					To develop an improved matrix for the isolation of HLW	172
U-233 Storage, Purification, Distribution, and Scrap Recovery								X	Provides for a national U-233 repository	939
TRU Waste Volume Reduction				X					Development of methods to reduce waste volume through compaction, incineration, and chemical conversion	190
Hydrofracture Mix Development Studies				X					Development of hydrofracture technique and grout mixtures for isolating intermediate level and dry wastes	246
Tritium Concentration by Bipolar Electrolysis			X	X					To develop suitable electrode systems for tritium removal from reactor and waste streams	500
Development of Technology for Land Burial				X					Development of improved techniques for shallow land burial of radioactive waste	1,037
Radionuclide Removal from ORNL Disposal Areas	X	X							To study different sources and modes of disposal, hydrologic transport and mechanisms and environmental factors important in radionuclide removal	807
Radionuclide Soil Movement Control Studies	X	X				X			To evaluate methods to control migration of radioactive components in solid waste	155
Basalt Waste Isolation			X	X		X			To assess feasibility of final geological storage in deep caverns in basalt at Hanford	18,300
Spent Unreprocessed Fuel (SURF) Facility Program			X	X					To provide interim, retrievable storage capability	12,500
HLW Immobilization Program				X					To develop technology for immobilization of HLW, ILW and other wastes for disposal in the national repository	5,700
Decontamination and Densification of Chop-Leach Cladding Residues				X					To develop and demonstrate a melt densification process for the loose hull product	600

Table 4-20. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Waste Management

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Electroplating for Surface Decontamination of Metals				X					To develop electropolishing into a large-scale decontamination technique	600
Krypton Solidification				X					To develop a way to incorporate Kr-85 into a solid matrix	275
Carbon-14 and Iodine-129 Fixation				X					To develop and demonstrate technology to immobilize I-129 and C-14 released during treatment of irradiated fuels	180
Nuclear Waste Vitrification Process				X					To demonstrate vitrification and packaging of HLLW as a silicate glass in canisters	16,785
Application of Acid Digestion to Commercial Solid Waste				X					To develop and demonstrate acid digestion for volume reduction of combustible waste	400
National Waste Terminal Storage Program	X	X	X	X					Program management, geological studies, engineering, and construction	42,000
									Total	149,922

SOLAR

The solar inputs were received from ET and cover the environmental control aspects of projects within both ET and CS; they are presented in Tables 4-21 through 4-26. The total FY 1978 funding related to environmental control technology was $4,315,000 or aproximately 2 percent of the solar FY 1978 budget. Compared to FY 1977, this was an increase of $1,629,000 and 0.5 percent. Of the $4,315,000 total, 84 percent ($3,641,000) was in the solar electric applications program with the following breakdown by subprograms: wind energy conversion systems ($2,510,000), ocean thermal energy conversion (OTEC) ($749,000), solar thermal electric ($255,000), and photovoltaics ($127,000). The remaining 16 percent of the total ($674,000) was within the thermal applications program, which covers biomass energy conversion ($570,000), solar heating and cooling of buildings ($70,000), and agricultural and industrial process heat ($34,000).

Within the wind energy conversion systems subprogram, the main environmental control emphasis is on health and safety analyses and compliance with National Environmetnal Policy Act (NEPA) requirements. Within OTEC, the majority of the funding is related to environmental impact issues, design control of power systems, cleaning techniques, and safety control. Solar thermal electric projects related to environmental control technology are involved with the environmental effects and control associated with the Barstow, California, 10-MWe solar thermal power plant. Photovoltaics, the remaining solar electric applications subprogram, is concerned with environmental effects and issues, especially in the area of toxicity measurement and control.

In the biomass subprogram of the thermal applications program, the primary funding is related to assessment of control technology for existing and planned biomass conversion facilities. In the solar heating and cooling of buildings and agricultural and industrial process heat subprograms, only one project each is listed. For the former, it involves characterizing the fire potential of various materials considered for use in residential solar heating and cooling systems. For the latter subprogram, a programmatic environmental assessment project is ongoing.

Table 4-21. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Biomass (Solar)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
EIS for Direct Utilization of Biomass Facility		X	X			X			Assessment of control technology needs	250
EIA for Fuels from Biomass Program						X			Assessment of entire biomass program	165
Pilot Silviculture Energy Farm at Savannah River		X	X			X			Assessment of control technology needs	20
Environmental Assessment of Woody Biomass Production						X			Assessment of pathological and entomological problems for woody biomass	50
Environmental Research Plan and Related Assessments						X			Assessment of environmental research plan	85
									Total	570

Table 4-22. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Conservation and Solar Application

PANEL SESSION SUBJECT: Solar Heating and Cooling of Buildings and Agricultural and Industrial Process Heat (SHACOB/AIPH)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Solar Heating and Cooling of Buildings										
NBS - Over Temperature and Fire Hazard Investigation of Residential Solar Heating and Cooling Systems		X							Characterize fire potential of various materials	70*
Agricultural and Industrial Process Heat (AIPH)										
Programmatic Environmental Assessment for AIPH						X			Assess potential environmental effects. 50%	34*
									Total	104

* NOTE: Projects Funded by ET

Table 4-23. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Solar Thermal Electric

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Effects of Solar Power Systems					X				Analyze microclimate and ecological effects of various solar collector systems in the southwest desert; assess pre- and post-construction impacts on 10MWe solar thermal plant at Barstow, California. 75%	75
Barstow 10MWe Solar Thermal Power Plant Environmental Assessment						X			Assess potential environmental effects	5
Solar Thermal Programmatic Environmental Assessment						X			Assess potential environmental effects. 50%	50
Barstow 10MWe Solar Thermal Power Plant Construction			X						General control around plant. 0.1%	125
									Total	255

Table 4-24. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Photovoltaics (Solar)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Photovoltaics Programmatic Environmental Assessment						X			Assess potential environmental effects. 50%	50
Mt. Laguna AF Radar Station 60kw Pu demonstration Environmental Assessment						X			Assess potential environmental effects. 50%	5
Mission Analysis of photovoltaic energy systems		X							Investigate environmental aspects. 5%	21
Improved Semiconductors for photovoltaic solar cells (coevaporation of $CuInSe_2$ 1.0lev)				X	X				Measure toxicity. 5%	10
Improved Semiconductors for photovoltaic solar cells				X	X				Measure toxicity. 5%	12
Systems analysis of photovoltaic power systems						X			Preliminary Assessment of environmental issues. 5%	23
Improved Semiconductors for photovoltaic solar cells (electrochemical method of depositing CdTe on glass)				X	X				Measure toxicity. 5%	6
									Total	127

Table 4-25. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Wind Energy Conversion Systems (Solar)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Small Machines	X	X			X	X			Monitoring; regulatory compliance; health and safety analyses	315
Institutional Barriers	X	X		X		X			Preparation of Environmental Development Plan (EDP) and economic and institutional studies	315
Siting						X			Environmental Impact Assessment (EIA) and Environmental Impact Statement (EIS) preparation and monitoring	180
Mod-OA Machine	X	X		X	X	X			Culebra and Block Island EIAs; special site requirements; monitoring, regulatory compliance, and health and safety studies	700
Mod-1 Machine					X				Regulatory compliance, monitoring and health and safety studies	250
Mod-2 Machine			X	X					Regulatory compliance and assessment	300
Supporting Research and Technology		X		X	X	X			Health and safety analyses, machine development, and assessing potential environmental issues	450
									Total	2,510

Table 4-26. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Ocean Thermal Energy Conversion (Solar)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Impact Assessment of OTEC-1						X			Identification of control measures on OTEC-1. 50%	15
Programmatic E/A for OTEC						X	X	X	Identification of control measures for OTEC program	62
OTEC Program Management support - Environmental Issues	X	X			X	X	X	X	Physical, climatic, Biological and Ecological. Impact Issues. 50%	120
Experimental study of flow problems related to OTEC	X	X	X						Design control of effluent discharges. 25%	24
Gulf of Mexico numerical model for OTEC	X	X	X				X		Design control of large scale OTEC deployment schemes	15
Toxicity and impingement/entrainment studies	X	X	X		X				Marine biota impact control for OTEC. 25%	30
OTEC Ocean measurements	X	X			X	X			Data base collection for design control specification. 10%	78
OTEC Mission Analyses			X	X			X		Design control for institutional and utility interface. 10%	60
OTEC Power Systems	X		X	X					Design control of power systems cleaning techniques for OTEC. 5%	200
OTEC Ocean Systems	X		X	X				X	Design of OTEC Ocean systems safety control. 1%	120
OTEC Biofouling and corrosion	X	X			X				Design of OTEC cleaning systems. 1%	25
									Total	749

GEOTHERMAL

Geothermal energy inputs to the FY 1978 DOE environmental control technology survey were received from ET and are presented in Table 4-27. Geothermal FY 1978 total funding related to environmental control activities was $8,741,600 or approximately 11 percent of the FY 1978 geothermal total budget. Compared to FY 1977, this was a decrease of approximately $29,000 and, compared to the total geothermal budget, approximately 7 percent. The total dollars devoted to environmental control technology within the FY 1978 geothermal projects basically remained constant; however, the budget increased by almost 70 percent, resulting in a decrease in the proportion of geothermal funding related to environmental control activities. This decrease was mainly due to increased budgets in programmatic areas not requiring a proportional increase in environmental control activities. On the other hand, programs in H_2S control technology, thermal control, subsidence, and exploration technology expanded, with the result that the total funds devoted to environmental control activities remained relatively constant.

In FY 1977, geothermal energy listed over 70 projects having environmental control technology aspects. The associated related FY 1977 funding ranged from $5,000 to $734,000. In this survey for FY 1978, the total number of geothermal projects with environmental control technology aspects was over 50, resulting in an approximate decrease of 20 projects, mainly in the areas noted in the preceding paragraph.

Table 4-27. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Geothermal Energy

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Downhole Descaling System		X	X	X	X				Determination of Scale Composition. 25%	50
Drilling Fluids Development				X					Development of Nontoxic Drilling Fluids. 15%	14.85
Drilling Fluid Instrument (test bed)	X	X	X						Development of Nontoxic Drilling Fluids. 25%	25
Electronic Circuits		X	X	X					Environmental Data Monitoring and Transmission. 10%	22
Computer Model Brine/Mineral System	X			X				X	Model Fluid Thermodynamics. 7.5%	15
Concrete Polymer Composite Material				X					Material Development to Increase Well Safety. 10%	9
High Temperature Polymer Well Cement	X			X					Well Material Development to Improve Integrity. 15%	75
High Temperature Inorganic Cement	X			X					Well Material Development to Improve Integrity. 15%	45
Precipitation and Scaling	X		X	X	X				Waste Materials Control. 10%	30
Iron Base Alloys vs Alternate Materials	X		X	X	X				Materials Corrosion Analysis. 10%	27.5
Standardized Fluid Analysis Techniques		X	X	X	X	X			Fluid Composition Determination. 10%	27.3
Silica Precipitation and Brine Management	X	X			X	X			Waste Materials Control. 25%	25
Well Completion Evaluation		X	X	X					Well Completion Safety and Technique Evaluation. 15%	45
Materials Identification		X	X			X			Materials Design Specifications. 5%	4.75
Study of Injection	X	X	X						Waste Disposal, Analysis. 10%	4
Rock Mechanics	X	X			X				Determination of Reservoir Rock Properties. 10%	26
Geothermal Well Logging Technology Development				X					Data Acquisition and Instrumentation Development. 30%	250
Log Interpretation	X	X							Reservoir Properties Determination. 20%	120

Table 4-27. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Geothermal Energy

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Passive & Active Electronic Components - Well Logging				X					Data Acquisition and Instrumentation Development. 10%	40
Liquid Dominated Reservoir Analysis	X	X			X				Analysis of Reservoir Conditions and Behavior. 10%	6
Resistivity of Rocks	X	X			X				Determination of Reservoir Rock Properties. 10%	6
Reservoir Engineering Management	X	X							Management of Reservoir Engineering Prog. 50%	125
Reservoir Engineering Techniques	X			X					Testing of Reservoir Assessment Tools and Techniques. 50%	150
Reservoir Engineering Subcontracts	X	X	X		X				Reservoir Properties and Performance Studies and Sample Analysis Techniques. 25%	275
Low Temperature Reservoir Assessment	X	X	X		X	X			Reservoir Properties and Performance Studies and Sample Analysis Techniques. 5%	150
COSO Support								X	General Program Support. 10%	8.7
High Temperature Resource Industrial Support		X			X	X			Environmental Support of High Temperature Development. 20%	430
High Temperature Reservoir Engineering	X	X			X				Reservoir Properties and Performance. 5%	50
GC Test Facility			X	X		X			Design and Evaluation of Environmental Control Systems. 10%	90.6
Geothermal Test Loop	X	X		X	X	X			Evaluation of Control Technology. 10%	190
Power Plant Component Tests					X	X			Environmental Compatability Tests. 40%	600
Geopressure Static and Dynamic Well Tests				X	X				Fluid Analysis and Reservoir Evaluation. 15%	900
Hot Dry Rock Technology Development		X	X		X	X			Environmental Support Studies and Environmental Design Considerations in Technology Development. 5%	250.7
INEL Environmental Monitoring	X	X			X	X			Baseline Monitoring and Environmental Assessment. 10%	20.5

Table 4-27. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Geothermal Energy

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Subsidence Control Program	X	X	X	X	X	X			Subsidence Research and Control Technology. 100%	750
H_2S Control - Steam Scrubbing	X	X	X	X	X	X			H_2S Control Technology - Steam Scrubbing. 100%	70
H_2S Control - Oxygen Injection	X	X	X	X	X	X			H_2S Control Technology - Brine Oxidation. 100%	395
H_2S Control Pilot Test Facility	X		X	X	X	X			H_2S Control Technology - Steam Scrubbing. 100%	1,300
Well Blow Out Control Analysis		X				X			Study and Assess Well Blow Out Control. 100%	50
Induced Seismic Studies	X	X			X	X			Study and Evaluation of Induced Seismic Potential Related to Geothermal Development. 100%	143
H_2S Control	X	X	X	X	X	X			H_2S Control Technology. 100%	100
EIA/EIS Evaluations						X	X		NEPA Environmental Reviews. 20%	55
Raft River Thermal Loop Facility			X	X	X				Environmental Control Systems Design and Environmental Sampling. 10%	800
Raft River Non-electric Applications		X				X			Environmental Studies and Assessments. 15%	60
Moderate Temperature Reservoir Engineering		X							Reservoir Behavior. 10%	20
Hawaii Geothermal Project	X	X			X	X			Environmental Monitoring, Effects, and Evaluation. 20%	45
Cerro Prieto Case Study		X			X	X			Subsidence, Seismicity Studies; Waste Disposal Testing. 25%	70
Seal Materials Program	X			X					Seal Material Standards Development for Fluid Control. 10%	35
Monitoring Instrument Development	X		X	X					Develop Capability for Monitoring Wastes and Plant Fluids. 10%	50
Geothermal Injection Fluid Characteristics		X			X			X	Case Study State of Art Application in Field. 10%	14
Mineral Solubility Data	X								Data for Testing Chemistry Models. 7.5%	26.7

Table 4-27. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Geothermal Energy

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Reservoir Rock & Fluid Properties	X				X				In Situ Properties. 75%	100
Exploration Technology	X	X			X				Surface Measurement of Reservoir Properties. 30%	300
Geopressure Well Site Environmental Monitoring	X	X			X	X			Environmental Monitoring of Well Sites. 20%	100
Geopressure Rock Mechanics	X	X							Determination of Reservoir Rock Properties. 75%	150
									Total	8,741.6

BASIC ENERGY SCIENCES

Inputs for basic energy sciences (BES) were received from the Directorate Office of Energy Research (ER) and are presented in Table 4-28. The total BES funding devoted to environmental control technology was $2,871,000 or approximately 2 percent of the total BES FY 1978 budget. Comparisons to FY 1977 cannot be made due to administrative and technical organizational changes made during the transition from ERDA to DOE.

The BES projects related to environmental control technology involve research into the nuclear and materials sciences and chemistry, engineering, mathematics, and geoscience. Most of the projects within BES associated with environmental control technology are in the area of chemical sciences. These include SO_2 fixation, atmospheric pollution monitoring, photochemistry, actinide chemistry, and materials chemistry. There are a total of 31 BES projects ranging in funding allocations related to environmental control technology from $17,000 to $470,000.

Table 4-28. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Research

PANEL SESSION SUBJECT: Basic Energy Science

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Fixation of Sulfur Dioxide in Fluidized Bed Combustion (BES/ANL)	X				X				100%	350
Heat Transfer Materials & Metastable Fluids (BES/ANL)	X								50%	50
Chemical Characterization of Radionuclides in Environment (BES/PNL)	X				X				40%	32
Atmospheric Trace Gases CO, NO_x, Halogenated Hydrocabons and Free Radicals by Mass Spectroscopy (BES/ANL)	X				X				75%	98
Mass Spectrometry Research for Organic and Inorganic Analysis (BES/ORNL)	X				X				25%	68
Partitioning and Concentration of Long-lived Radioelements from Reactor Wastes (BES/ANL)	X								10%	56
Waste Stream Processing Studies (BES/ORNL)	X								15%	34
Tritium Separation Technology (BES/ORNL)	X								20%	30
Cyclic Separations Process Research (BES/BNL)	X								15%	21
Atmospheric Pollution Monitoring by Diode Lasers (BES/AMES)	X				X				75%	142
Solvent Extraction Studies Using High-Molecular Weight Amines (BES/Texas Southern Univ.)	X								60%	21
Chemistry of Radioiodine in High Radiation Fuel Separation (BES/ORNL)	X								40%	48
Mechanism for Removal of Radionuclides from Waste Streams (BES/Mound)	X								50%	38
Analytical Separations (BES/Ames)	X				X				25%	17

Table 4-28. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Research

PANEL SESSION SUBJECT: Basic Energy Science

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Formation of Oxyacids of Sulfur from SO_2 (BES/LBL)	X								40%	26
Labile SO_2 Complexes as a Scavenging Basis (BES/LASL)	X								40%	46
Collection of Noble Gases with Oxidizing Salts (BES/ANL)	X								40%	120
Photochemistry of Materials in the Stratosphere (BES/LBL)	X								60%	110
Research in Chemical Kinetics (BES/Univ. of Calif./Irvine)	X								50%	65
Combustion and Pollution Chemistry: Gas Phase Radiolysis (BES/ANL)	X								30%	100
Chemical Analysis (BES/LBL)	X				X				40%	42
Determination of Fragile Molecules in Environment (BES/BNL)	X				X				75%	82
Research in Nuclear Chemistry (BES/Florida State U.)	X								Characterization of the behavior of the actinide elements under carefully controlled laboratory conditions applicable to the environment. 35%	25
Actinide Chemistry (BES/LBL)	X	X	X	X					Development of new, actinide-specific chelating agents to be used in aqueous systems and agents compatible with the human biosystem. Measurement of formation constants of actinides with environmentally important ligands. 25%	200
Heavy Element Chemistry Research (BES/ANL)	X								Chemical behavior of actinide ions in aqueous solutions. 10%	100
Chemistry of Transuranium Elements and Compounds (BES/ORNL)	X								Actinide ion exchange behavior of clays and other geologic media. 10%	100

Table 4-28. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Research

PANEL SESSION SUBJECT: Basic Energy Science

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Ceramics Research - Coal Structure and Impurities (BES/ORNL)	X								10%	50
Recovery of Metal Values From Fly Ash (BES/Ames)	X				X				50%	60
Materials Chemistry Related to Fusion Reactor Programs (BES/ORNL) (Confinement of Tritium in Heat Exchanges)	X								100%	470
Liquid Metals Chemistry (BES/ANL) Extraction of Tritium from Molten Salts	X								40%	100
Tritium Chemistry Associated with the Lithium Blanket and Container Materials (BES/LASL)	X								100%	170
									Total	2,871

MAGNETIC FUSION ENERGY

Magnetic fusion energy inputs to the FY 1978 DOE environmental control technology survey were received from ET and are presented in Table 4-29. Magnetic fusion energy FY 1978 total funding related to environmental control activities was $1,335,000 or approximately 0.5 percent of the FY 1978 magnetic fusion energy total budget. Compared to FY 1977, this represents an increase of $555,000 and 0.2 percent in the total budget. The primary emphasis, as in FY 1977, was on tritium containment, control, permeation, and cleanup.

Table 4-29. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Magnetic Fusion Energy

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
A. Development and Technology										
1. Tritium Systems Test Assembly				X	X				A major purpose of this facility is the demonstration of tritium containment and control technology, under both normal and accident conditions, for the Experimental Test Facility to be operated in the 1980s. Approximately 40% of the FY 1978 budget is committed to containment and control technology development.	500 (OP) 500 (EQ)
2. Alloy Development	X								Approximately 3% of this program element in FY 1978 is devoted to studies of tritium permeation through potential fusion reactor materials. Successful development of low permeation alloys will significantly reduce routine tritium releases from fusion power plants.	100 (OP) 10 (EQ)
3. Fusion Reactor Safety Research						X			Some fusion reactor conceptual designs have suggested that large quantities of activated structural materials may be produced during operation of these plants. Approximately 10% of the FY 1978 budget for this program element is being applied to evaluating the waste management implications of fusion power.	50 (OP)

NOTES: OP - Operating Expenses
EQ - Equipment Costs
PACE - Plant and Capital Equipment

Table 4-29. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Energy Technology

PANEL SESSION SUBJECT: Magnetic Fusion Energy

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
B. Technical Projects										
1. Tokamak Fusion Test Reactor				X					Tritium cleanup systems to contain routine and accidental spills of tritium within facility. Development of these systems will provide design and operating experience for later magnetic fusion facilities. These represent approximately 1% of the FY 1978 project budget.	50 (PACE) 100 (OP)
2. Fusion Materials Irradiation Testing Facility				X					Tritium cleanup from liquid lithium systems. Development of these systems will provide design and operating experience for later magnetic fusion facilities. These represent approximately 1% of FY 1978 project budget.	25 (OP)
									Total	1,335

ENVIRONMENT AND SAFETY

All of the projects applicable to environmental control (Table 4-30) within ASEV were located in the Division of Environmental Control Technology. The total EV FY 1978 funding associated with environmental control activities was $31,530,000 or approximately 14 percent of the total EV FY 1978 budget. In comparison to the funding allocation reported in FY 1977, this represents an increase of $13,557,000 and approximately 6 percent in relationship to total EV funding. O&A activities made up 48 percent ($15,056,000) of the total, and D&D projects made up the remaining 52 percent ($16,474,000).

O&A activities within ECT are listed under the budget heading of environmental engineering (EE) and are mainly in the areas of supporting fossil and nuclear energy development. Of the $15,056,000 funding allocation within EE, fossil energy related activities made up 57 percent and nuclear energy, 38 percent. The remaining 5 percent was divided into conservation (2 percent), geothermal (2 percent), and solar (1 percent).

In the fossil energy area, the majority of the applicable EV funding was devoted to environmental control activities related to the production of energy from coal. The remainder was related to petroleum and natural gas programs with emphasis on liquefied natural gas spill test projects and safety and control programs.

Nuclear energy related activities were divided into two main areas. The first involved the analysis of nuclear fuel cycles to assess the adequacy of existing environmental controls and the need for additional control requirements. The remainder of the nuclear energy associated activities were in nuclear materials transport efforts devoted to transportation studies involving risk assessments and testing, including shipping casks for radioactive wastes. Additionally, transportation statistics on accident frequency and severity and analyses of their significance were kept current, using the latest computer technology.

Geothermal, solar, and conservation activities were a small portion of the total EE funding related to environmental control technology, primarily due to the early stage of development within these energy technologies. Principal emphasis was placed on H_2S and liquid waste control for geothermal related activities, environmental and fire hazards and solid waste disposal for solar related activities, and urban and industrial waste control and electric power transmission environmental impacts for conservation related efforts.

D&D activities related to environmental control technology totaled $16,474,000 and were primarily divided into two major categories: (a) surveillance and disposition of surplus nuclear facilities and (b) remedial action programs for inactive uranium mill tailings sites, Grand Junction, Colorado, and formerly utilized MED/AEC sites. The former category, which made up 79 percent of the total D&D funding, was further divided

into subelements of surveillance, disposition methods R&D, plans for disposition, and actual disposition of surplus facilities. The remedial action programs were mainly concerned with determining the radiological status of sites, reducing public exposure to radiation hazards, and assessing methods of short- and long-term stabilization and containment of radiation hazards.

Table 4-30. Projects With Environmental Control Aspects

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Coal										
Environmental Control Technology for Generation of Electrical Power from Coal (ANL)		X				X			Comparative assessments of control technologies. 100%	1,100
Environmental Control Technology of U.S. Stripmining Sites (ANL)		X			X	X			Evaluate control technologies for new and expanded mines. 100%	430
Assessment of Once-Through Cooling Water Control Technology (ANL)		X				X			Cooling water control. 100%	75
Preliminary Overview of Environmental Control Technology for CO_2 Emissions (BNL)		X				X			Emission control options. 100%	15
Evaluation of Pollutants from Flash-Hydro Pyrolysis (BNL)		X							Evaluate pollutants versus control requirements. 100%	50
Environmental Control Technology Aspects of In Situ Gasification (LLL)		X			X	X			Identify control requirements. 100%	185
Trace Element Characterization and Removal/ Recovery from Coal (LASL)		X			X	X			Identify coal trace elements and options for removal and recovery. 100%	325
Assessment of the Radiological Impact of Coal Utilization (LASL)		X			X	X			Control of radiological emissions. 100%	35
Assessment of Environmental Control Technology for Coal Conversion Wastewater Systems (ORNL)	X					X			Evaluate adequacy of existing control methods and identify new control options. 100%	200
Control of Hydrocarbon Emissions from First Generation Gasifiers (ORNL)					X	X			Emission control. 100%	57
Environmental Assessment for Gasifiers in Industry (ORNL)		X			X	X			Emissions assessment and control options. 100%	250

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Control Assessment of Cogeneration as a District Heat (ORNL)		X				X			Emission control options. 100%	50
Assessment of Environmental Control Options for Global CO_2 (ORNL)						X			Impact of CO_2 on Global Environment. 100%	40
Year 2000 Study (PNL)		X				X			Identify potential problems associated with energy materials transportation. 100%	350
Waste Heat Management in the Electric Power Industry (MIT)						X			Assessing environmental control options. 100%	300
Porous Dike Evaluations (EPA)		X		X		X			Evaluate intake control. 100%	130*

*EPA and New England Power Funding $130,000 each.

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Assessment of Environmental Control Technology for Selected First Generation Coal Gasifiers (PNL)						X			Provide economics for existing and new control methods. 100%	10
Dry/Wet Cooling Towers (PNL)		X				X			Effluent control studies. 100%	50
Assessment of Radiological Impact of Western Coal Utilization (MOUND)		X			X	X			Control of radiological emissions. 100%	59
Assessment of Underground Coal Gasification on Groundwater Quality (LERC)		X			X	X			Quantify changes in groundwater quality and determine control technology needs. 100%	150
Treatment of Synthane Gasification Wastewaters (PERC)		X			X	X			Characterize process wastewaters, evaluate effluents, concentrations, and devise treatment methods. 100%	200
Separation Processes for Water Effluents from Coal Conversion Plants (U. of Missouri)	X					X			Evaluate feasibility of solvent extraction for contaminants removal, 100%	35
Survey of Environment Control Technology Activities (Aerospace Corp.)								X	Define and catalog all the DOE projects related to environmental control technology. 100%	230
Preliminary Assessment of Environmental Control Options for Noise (Bolt Beranek and Newman, Inc.)		X			X	X			Assess noise control needs and options. 100%	27
Evaluation of Lurgi Gasifier Two-Stage Quench for Water Pollution Control (Arthur G. McKee & Company)		X			X				Water pollution control studies. 100%	- 179
Evaluation of the Effect of Coal Cleaning on Fugitive Elements (BCR)		X			X	X			Assess coal preparation techniques and controls. 100%	183

Table 4-30: (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Removal of NO_x and SO_2 from Flue Gas Through Electron Beam Irradiation (Research-Cottrell)		X				X			Dual control of SO_2 and NO_x emissions. 100%	20
Environmental Aspects of Coal Slurry Transportation (UCLA)		X			X	X			Environmental impacts of coal slurries. 100%	11
Environmental Control Implications of Large Scale Lignite Utilization (Texas A&M Univ.)		X			X	X			Assess control requirements. 100%	70
Coal Coating for Environmental Control in Shipping and Storage (Atlantic Research Co.)		X		X		X			Assess coal coating as an environmental control. 100%	100
Control of Emissions from Gasifiers Using Coal with a Chemically Bound Sulfur Scavenger (Battelle, Columbus)						X			Assess potential to pretreat gasifier feedstock to control sulfur in product gas. 100%	78
Concentration of Wastewater for Recovery/ Disposal (Concentration Specialists)		X			X	X			Assess the potential for reverse osmosis and/or freezing to concentrate select coal treatment wastewaters. 100%	20
Coal Assessment						X			Assess impact of coal utilization. 100%	59
Environmental Control Requirements for Coal Conversion Solid Wastes Management (ORNL)		X			X	X			Assess control requirements. 100%	30
									Subtotal (Coal)	5,103

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Petroleum and Gas										
Identification of Refractory Organic Compounds in Treated Refinery Wastes (ANL)	X					X			Evaluation of the effectiveness of activated sludge and activated carbon waste water treatments. 100%	140
LNG Spill Program (LLL)		X				X			Preparation of LNG spill test program. 100%	1,156
Integrated LNG Safety and Control Program (PNL)		X				X			Identify environmental impacts. 100%	300
Design for Medium Scale LNG Spill Tests (Holmes and Narvor, Inc.)	X								Determine requirements for medium scale test site. 100%	153
Assessment of Hazards and Control of LNG on Water (USCG)	X				X	X			Determine extent of hazards. 100%	65
Scale Effects of LNG Hazard Analysis and Testing		X				X			Impact of scaling on LNG testing. 100%	70
Medium Scale LNG Spill Tests (U.S. NWC, China Lake)	X				X				Analysis and planning for field tests. 100%	133
Atmospheric Methane Detection (MIT)	X	X			X	X			Laboratory and field tests of sensors. 100%	33
LNG - Evaluate Feasibility of Methods and Systems for Reducing Tanker Fires (Arthur D. Little)						X			Assess control options. 100%	50
Study of Gelled LNG (Aerojet Energy Conversion Company)	X					X			Collect basic data to be used for control and safety assessments. 100%	50
Assessment of Environmental and Safety Controls for Hydrogen(LASL)	X					X			Define potential safety problems of large-scale hydrogen transport. 100%	156

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Burning of Oil Spills (PNL)		X				X			Compile bibliography, assess prior work, and suggest new approaches. 100%	50
Oil Spill Training School (Corpus Christi State University)							X		Conduct test classes and review. Conduct a series of 14 actual classes. 100%	50
Assessment of Treated Versus Untreated Oil Spills (University of Rhode Island)		X			X	X			Determine practicability and feasibility of treating oil spills with dispersants. 100%	495
Assessment of Environmental Control Aspects of Enhanced Oil Recovery Wastewater Cleanup (University of Tulsa)	X				X	X			Assess efficiency and practicability of membrane processes for wastewater treatment. 100%	35
									Subtotal (Petroleum and Gas)	2,936

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Oil Shale										
Control Technology for In Situ Oil Shale Retorts (Water/Gas Migration) (LBL)		X			X	X			Identify potential pollutants and controls required. 100%	25
Spent Shale as Control Technology for Oil Shale Retort Water (LBL)		X			X	X			Assess potential use of spent shale as a water cleanup media. 100%	50
Fate of Hg at PARAHO Demonstration Site (LBL)		X			X	X			Hg control requirement. 100%	30
Preliminary Assessment of Control Technology at Rio Blanco Site (LLL)		X				X			Assess environmental intrusions and controls required. 100%	40
Control of Leachate from Shale and Spent Shale (LASL)		X			X	X			Control assessments. 100%	70
Assessment of Environmental Control for Wastewater in In Situ Oil Shale Retorting (PNL)	X	X				X			Assess current technology for treatment and disposal of wastewaters. 100%	150
Trace Element Analysis of Oil Shale Zones (LERC)		X			X	X			Identify trace elements in oil shale zone. 100%	20
Environmental Control Implications of Oil Shale Development (National Science Foundation)		X				X			Assess Controls. 100%	9
Analysis of Environmental Control for Oil Shale Development (University of Utah)		X							Analyze environmental controls envisaged for oil shale and tar sand developments. 100%	56
									Subtotal (Oil Shale)	450

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Geothermal										
Geothermal Loan Guarantee Program (GLGP) Assessment of Environmental Controls (LLL)		X				X			Assess environment and safety issues. 100%	40
Imperial Valley Environmental Project (IVEP): Assessment of Control Technologies (LLL)		X				X			Assessment of controls used in IVEP. 100%	100
Research Program Plan for Geothermal Liquid Waste Disposal (PNL)						X			Review state-of-the-art for liquid waste disposal. 100%	95
Evaluation of H_2S Control Technology for Geothermal Energy Sources (MRI)		X	X						State-of-the-art review of H_2S emission control. 100%	36
Preplanning Environmental Projects: Assessment of Environmental Controls (LLL)		X				X			Determine environmental control requirements for high priority development regions. 100%	15
									Subtotal (Geothermal)	286
Solar										
Environmental and Fire Hazards of Materials Used in Solar Heating and Cooling (Sandia)		X	X			X			Compile a list of solar heating and cooling materials and examine the environmental impacts of these materails. 100%	118
Assessment of Environmental Controls for Energy Production Facilities Using Solar Derived Fuels (Ames Lab.)		X			X	X			Evaluate and assess control options in the conversion cycle. 100%	87
									Subtotal (Solar)	205

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Conservation										
Assessment of Environmental Control Technologies for High Magnetic Field (LASL)	X					X			Assess efficiency of methods to reduce magnetic field strengths. 100%	30
Compressed Air Energy Storage: Environmental Control Concerns (PNL)		X				X			Identify control concerns. 100%	25
Assessment of Energy Conserving Industrial Waste Treatment Technology (PNL)		X				X			Provide overview of current practices and prepare a plan for alternate control options. 100%	30
Environmental Control Technology Requirements for Future AC, High-Voltage Overhead Transmission Facilities (SRI International)		X				X			Overview of environmental impacts. 100%	66
Status of Emissions and Environmental Aspects of Auto Fuels and Engines (Aerospace Corporation)						X			Assess the environmental aspects. 100%	50
State-of-the-Art Review of State/Federal Environmental Regulations Concerning Electric Effects of Overhead Transmission Lines (Shah & Associated)		X							Review government regulations versus environmental control needs. 100%	10
Environmental Control Requirements in Solid Waste Processing and Energy Recovery Facilities (Ames Lab.)		X			X	X			Determine controls required for solid wastes. 100%	120
									Subtotal (Conservation)	331

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Nuclear Energy										
Analysis of Nuclear Fuel Cycle (PNL)		X				X			Overview of total nuclear fuel cycle in terms of controls. 100%	475
Transportation Safety Studies (PNL)		X				X			Develop risk assessments for transport of radioactive material. 100%	300
Development of Material Constitutive Descriptions for Environmental and Safety Control Shipping Container Systems (ANL)	X					X			Shipping container assessments. 100%	60
Study of Decommissioning Accelerators and Fusion Devices (ANL)		X				X			Study radiologic safety measures for decommissioning accelerators and fusion devices. 100%	85
Development of Structural and Thermal Analysis Methods for Environmental and Safety Control Assessments of Energy Material Shipping Container Systems (LASL)	X			X		X			Predict shipping container response to impact accident conditions. 100%	260
Review Criteria for Nuclear Criticality Safety Evaluation for Transportation of Fissile Materials (ORNL)		X							Evaluate radioactive material transport safety. 100%	30
Full Scale Impact Testing for Environmental and Safety Control Assessment of Energy Material Shipping Container Systems (ORNL)	X	X				X			Full scale testing on damage to casks and to contents. 100%	220
DOE-Wide Transportation Statistics Data Bank (ORNL)								X	Maintain data bank on DOE statistics regarding transportation. 100%	68

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology (Environmental Engineering)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Seabed Disposal Program (Sandia)	X	X				X			Determine the environmental and technical feasibility of storing high level wastes (HLW) into the ocean floor. 100%	2,830
Package Failure from Malevolent Attacks (Sandia)		X			X	X			Determine attack impact and improvement measures. 100%	200
Study of Physical Parameters of Transportation Accidents (Sandia)		X			X	X			Describe accident environment to which large casks would be exposed. 100%	70
Full Scale Vehicle Testing Program (Sandia)		X		X	X	X			Assess validity of analyses and scale model testing versus full scale testing. 100%	550
Transportation Accident Environmental Data Bank (Sandia)								X	Storage of relevant environmental accident data. 100%	60
Transportation and Packaging Films (Sandia)							X		Production of films on transporting and packaging radioactive wastes. 100%	60
Scale Model Impact Testing for Environmental and Safety Control Assessments of Energy Material Shipping Container Systems (Battelle)	X	X		X	X	X			Scale model fabrication and testing. 100%	386
"Transporting Radioactive Cargoes" Exhibit (NORCUS)							X		Increases public awareness of package designs and testing for radioactive material. 100%	71
Nuclear Transportation Overview and Assessment						X			Assess transportation options. 100%	20
									Subtotal (Nuclear)	5,745
									Subtotal (Environmental Engineering)	15,056

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology

(Decontamination and Decommissioning)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Surveillance										
Surplus Facility Surveillance (ANL)					X				Radiation hazard monitoring. 100%	24
Surplus ORNL Reactor Surveillance (ORNL)					X				Radiation hazard monitoring. 100%	155
Fission Product Development Laboratory (FPDL) Surveillance (ORNL)					X				Radiation hazard monitoring. 100%	200
Piqua Surveillance (Battelle)					X				Radiation hazard monitoring. 100%	2
Idaho National Engineering Laboratory (INEL) Shutdown Reactors (EG&G Idaho, Inc.)					X				Radiation hazard monitoring. 100%	65
GNOME Surveillance (REECO)					X				Radiation hazard monitoring. 100%	15
BONUS Surveillance (CEER, P.R.)					X				Radiation hazard monitoring. 100%	5
Surveillance of Hanford 200 Area Surplus Facilities (Rockwell Hanford Operations)					X				Radiation hazard monitoring. 100%	410
Surveillance of Hanford 100 Area Surplus Facilities (United Nuclear Industries, Inc.)					X				Radiation hazard monitoring. 100%	172
Heavy Water Components Test Reactor (HWCTR) Surveillance (E.I. duPont de Nemours and Company, Inc.)					X				Radiation hazard monitoring. 100%	5
									Subtotal (Surveillance)	1,053

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology

(Decontamination and Decommissioning)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Disposition Methods R&D										
Decommissioning of Retired Hanford Facilities Technology (PNL)			X	X		X			Development and testing of decommissioning techniques. 100%	245
Recycle of Contaminated Scrap Metals (NLO)			X	X		X			Provide a means of scrap metal decontamination. 100%	155
Contaminated Equipment Volume Reduction (Rockwell International Corp.)	X		X	X					Reduction of the volume of contaminated equipment to a size and form suitable for terminal storage or disposal. 100%	250
Removal of Actinides from Contaminated Soil (Atomics International)		X				X			Development of soil decontamination techniques. 100%	50
Development of a Decommissioning Handbook (Nuclear Energy Services)		X							Development of a handbook for cost estimating and decommissioning planning. 100%	100
									Subtotal (Disposition Methods R&D)	800

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology

(Decontamination and Decommissioning)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Planning for Disposition of Surplus Facilities										
Assessment of Disposition Options for NFS (ANL)						X			Assess environmental impacts. 100%	900
Planning for Decommissioning of Retired Hanford Facilities (PNL)		X							Establish decommissioning plan. 100%	60
Characterization of Hanford 300 Area Burial Grounds (PNL)					X	X			Perform environmental surveys to define hazards of buried radionuclides. 100%	535
DOE National D&D Plan (PNL)		X							Provide the framework for actions leading to the progressive reduction of the inventory of surplus facilities. 100%	75
Environmental Impact of NFS Facility Decommissioning (Battelle-Columbus)		X							Determine environmental impact. 100%	175
Supervision and Decontamination of Niagara Falls Site (NLO)		X			X				Decontaminate and consolidate contaminated rubble. 100%	100
Production Reactor Decommissioning Study (United Nuclear Industries, Inc.)		X				X			Assess decommissioning options. 100%	275
National DOE D&D Planning Program (Atomics International)		X							Provide the framework for actions leading to the progressive reduction of the inventory of surplus facilities. 100%	514
									Subtotal (Planning for Disposition of Surplus Facilities)	2,634

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology

(Decontamination and Decommissioning)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Disposition of Surplus Facilities										
D&D Plutonium Fabrication Facility (ANL)					X	X		X	Removal of potential environmental hazard. 100%	199
Disposition of Excess Contaminated LASL Facilities (LASL)		X			X	X		X	Removal of potential environmental hazard. 100%	400
D&D of New Brunswick Laboratory (Chicago Operations Office)					X	X		X	Removal of potential environmental hazard. 100%	550
D&D of Surplus INEL Contaminated Facilities (EG&G Idaho, Inc.)					X	X		X	Removal of potential environmental hazard. 100%	1,040
GNOME Site Decommissioning (Nevada Operations Office)					X	X		X	Removal of potential environmental hazard. 100%	197
Nuclear Rocket Development Station (NRDS) Site Surveillance and Disposition (REECO)					X	X		X	Removal of potential environmental hazard. 100%	313
Radiological Survey and Cleanup of area 25, NRDS (REECO)					X	X		X	Removal of potential environmental hazard. 100%	365
Decontamination of CEER Reactor Facility (CEER)					X	X		X	Removal of potential environmental hazard. 100%	150
Weldon Spring Site Supervision and Decommissioning (NLO)			X		X			X	Removal of potential environmental hazard. 100%	45
D&D of Hanford 200 Area Surplus Facilities (Rockwell International Corp)					X	X		X	Removal of potential environmental hazard. 100%	750
D&D of Space Nuclear Auxiliary Power (SNAP) Facilities (Atomics International)					X	X		X	Removal of potential environmental hazard. 100%	1,510
D&D of Sodium Reactor Experiment (SRE) Facility (Atomics International)					X	X		X	Removal of potential environmental hazard, 100%	3,006
									Subtotal (Disposition of Surplus Facilities)	8,525

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology
(Decontamination and Decommissioning)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Remedial Actions at Inactive Mill Tailings Sites										
Environmental Impact Statement (EIS) on Salt Lake City Site (ANL)						X			Define environmental impacts. 100%	150
Support of Phase II and III Activities (ORNL)					X	X			Field measurements and assessments. 100%	50
Asphalt Emulsion Sealing of Mill Tailings (PNL)	X	X				X			Stabilization of mill tailings. 100%	30
Inactive Uranium Mill Tailings Sites Remedial Action (Ford Bacon & Davis Utah, Inc.)	X	X				X			Support remedial action programs. 100%	181
									Subtotal (Remedial Action at Inactive Mill Tailings Sites)	411
Grand Junction Remedial Action Program										
Grand Junction Remedial Action Program (State of Colorado)					X	X		X	Reduce public exposure to radiation hazards. 100%	800
									Subtotal (Grand Junction Remedial Action Program)	800
Remedial Actions at Formerly Utilized MED/AEC Sites (FUSRAP)										
Radiological Assessment of Contaminated Excess Property - 8 Sites (ANL)					X	X			Determine radiological status of sites. 100%	222
Chupadera Mesa Assessment (LASL)					X	X			Determine radiological status. 100%	90
Radiological Survey of Excess MED/AEC Property 6 Sites (ORNL)					X	X			Determine radiological status. 100%	900
Environment Impact Statement (EIS) Assistance and Preparation (ORNL)					X	X			Prepare EIS for Canonsburg, Pa. Site and St. Louis Airport Storage Site. 100%	200
Formerly Utilized Sites Remedial Action (Ford Bacon & Davis Utah, Inc.)					X	X			Prepare Engineering Assessments for Sites. 100%	485
D&D of Previously Excessed Sites (HQ)					X	X		X	Removal or containment of potential environmental hazards. 100%	319

Table 4-30. (continued)

OFFICE OF ASSISTANT SECRETARY FOR: Environment (EV)

PANEL SESSION SUBJECT: Environmental Control Technology
(Decontamination and Decommissioning)

Project/Element Title	Primary Categories of Relationship to Environmental Control								Portion of the Project or Element Related to Environmental Control Technology	FY 1978 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Fencing of Contaminated Perimeter - Middlesex Site (HQ-PAO)			X					X	Containment of potential environmental hazards. 100%	10
Radon Measurements (EML)					X				Determine Radon and Radon Daughters. 100%	25
									Subtotal (FUSRAP)	2,251
									Subtotal (D&D)	16,474
									Total (ECT)	31,530

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VI. GLOSSARY

AEC	Atomic Energy Commission
AF	United States Air Force
AIPH	agricultural and industrial process heat
ANFLOW	anaerobic digestor using fluidized bed combustion
ANL	Argonne National Laboratory
ASEV	Assistant Secretary for Environment
BCR	Bituminous Coal Research, Inc.
BES	basic energy sciences
BNL	Brookhaven National Laboratory
B/O	budget outlay
CEER	Center for Energy and Environmental Research
CS	Assistant Secretary for Conservation and Solar Applications
DC	direct current
D&D	decontamination and decommissioning
DOE	Department of Energy
E/A	Environmental Assessment
ECT	Division of Environmental Control Technology
EDP	Environmental Development Plan
EE	environmental engineering
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EML	Environmental Measurements Laboratory
EPA	Environmental Protection Agency
EQ	equipment costs
ER	Office of Energy Research
ERDA	Energy Research and Development Administration
ET	Office of Assistant Secretary for Energy Technology
FPDL	Fission Product Development Laboratory
FUSRAP	Formerly Utilized MED/AEC Sites Remedial Action Program
FY	fiscal year
GC	Gulf Coast
GLGP	Geothermal Loan Guarantee Program
HEPA	high-efficiency particulate air (filter)
HLLW	high-level liquid waste
HLW	high-level waste
HQ	DOE Headquarters
HVDC	high-voltage direct current
HWCTR	Heavy Water Components Test Reactor

ICPP	Idaho Chemical Processing Plant
ILW	intermediate level waste
INEL	Idaho National Engineering Laboratory
IVEP	Imperial Valley Environmental Project
LASL	Los Alamos Scientific Laboratory
LBL	Lawrence Berkeley Laboratory
LERC	Laramie Energy Research Center
LLL	Lawrence Livermore Laboratory
LMFBR	Liquid Metal Fast Breeder Reactor
LNG	liquefied natural gas
LPG	liquefied petroleum gas
MED	Manhattan Engineer District
MHD	magnetohydrodynamics
MIT	Massachusetts Institute of Technology
MRI	Midwest Reseach Institute
NBS	National Bureau of Standards
NCRR	National Center for Resource Reserve
NEPA	National Environmental Policy Act
NFS	Niagara Falls Site
NLO	National Lead Company of Ohio
NOAA	National Oceanic and Atmospheric Administration
NORCUS	Northwest College and University Association for Science
NRC	Nuclear Regulatory Commission
NRDS	Nuclear Rocket Development Station
NTS	Nevada Test Site
NWC	Naval Weapons Center (China Lake, California)
O&A	overview and assessment
OP	operating expenses
ORNL	Oak Ridge National Laboratory
OTEC	ocean thermal energy conversion
PACE	plant and capital equipment
PAO	Princeton Area Office
PDU	Process Development Unit
PERC	Pittsburgh Energy Research Center
PNL	Pacific Northwest Laboratory
R&D	research and development
RD&D	research, development, and demonstration
REECO	Reynolds Electric and Engineering Company

SNAP	space nuclear auxiliary power
SRC	solvent refined coal
SRE	Sodium Reactor Experiment
SURF	spent unprocessed fuel
TRU	transuranic waste
UCLA	University of California at Los Angeles
USCG	United States Coast Guard

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