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Environmental Control Technology Activities of the Department of Energy in FY 1977

November 1977

U.S. Department of Energy
Division of Environmental Control Technology
Washington, DC 20545

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PREFACE

This inventory covers environmental control related activities carried out during Fiscal Year (FY) 1977 by the Energy Research and Development Administration (ERDA). For clarity, no attempt has been made within the body of the report to translate ERDA organizational terminology to that of the Department of Energy (DOE). The FY 1978 edition will survey all 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 emerging energy technologies and the promotion of energy conservation. An integral and significant part of that responsibility includes the balancing of energy goals with environmental requirements to protect and enhance the general health, safety, and welfare of the nation. This requires that environmental effects be considered and mitigating measures by taken in all energy processes through incorporation of environmental and safety controls which are developed as an integral part of energy system design.

The Division of Environmental Control Technology (ECT) within the office of 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 independent overview and assessments designed to provide this assurance or to establish the Research and Development (R&D) requirements for environmental controls. The energy technology offices have the direct responsibility for conduct of RD&D of environmental controls in conjunction and in phase with their respective energy technology RD&D programs to assure environmental acceptability of the energy technology at commercialization.

This inventory of environmental control technology activities was initiated by the Administrator, ERDA, prior to the incorporation of that administration within the Department of Energy. This compilation of total Energy Research and Development Administration (ERDA) environmental control technology activities, and associated funding, related to environmental control technology identifies the resources committed by ERDA to demonstrate its objective to protect and enhance the general health, safety, and welfare of the nation in the Research, Development, and Demonstration of energy systems. Again, it should be stressed that only ERDA research, development, and demonstration activities are covered in this report. The compilation for FY 1978 will encompass all of the DOE activities.

II. Purpose

The primary purpose of this first in a series of annual reports is to identify and catalog the DOE's environmental control activities conducted in support of developing environmentally acceptable energy technologies. Since environmental control technology is an integral part of the DOE energy technology RD&D effort, the total program activity in this area is not clearly identifiable. This inventory 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 distinguish explicitly actual DOE efforts in this area so as to provide a basis for establishment of future needs and requirements. This report will provide an initial reference source to be used for future environmental control planning within the DOE and to serve as a reference base from which related activities outside of the DOE may be evaluated and compared.

As the first in a series of annual reports on environmental control technology activities within the DOE, this report will serve as a basis for evaluating progress in the development of environmental controls. As a baseline comparison datum, it will provide the background material required to evaluate and assess the environmental control accomplishments, issues, gaps, and overlaps associated with energy development within the DOE, in conjunction with other agencies, and in the private sector.

III. Summary

The total ERDA FY 1977 funding allocation related to environmental control activities, as shown in Table III-1, was $184,683,000. This corresponds to approximately 3% of the Total FY 1977 ERDA budget. The distribution of this $184,683,000 by each office is depicted in Figure III-1. Detail project listings are provided in Section IV. The office of the Assistant Administrator for Fossil Energy (AFE) and the office of the Assistant Administrator for Nuclear Energy (ANE) together accounted for 80% of the total ERDA FY 1977 funding allocation related to environmental control technology.

The distribution by energy technology category is depicted in Figure III-2. The coal program was almost half (48 percent) of the total, followed by nuclear with 38 percent, of which 30 percent was related to waste management, production, and reprocessing. Geothermal comprised 5 percent and conservation 3 percent while the remaining categories were each 2 percent or less of the total FY 1977 funding related to environmental control technology. Tables III-2 through III-8 present further details for the office of the Assistant Administrator for Conservation (AC), AFE, ANE, the office of the Assistant Administrator for Solar, Geothermal, and Advanced Energy Systems (ASGA), and the office of the Assistant Administrator for Environment and Safety (AES).

Table III-2 presents the funding breakdown for Conservation. As shown in Figure III-3, 46 percent of the funding was in the Division of Electric Energy Systems. This work is mainly directed at electric field effects of direct current lines, research in the biological effects of high voltage electric fields, and animal studies regarding transmission line effects.

Fossil Energy funding allocations are shown in Table III-3 with breakdowns for Coal, Oil Shale and In-Situ Technology, and Petroleum and Natural Gas. The associated distribution of funding, within these three programs, is depicted in Figure III-4. Since the Coal program comprises the majority (95 percent) of the AFE funding associated with environmental control activities, Table III-4 and Figure III-5 are presented to show the distribution within the coal program. More than half (62 percent) of the coal program environmental control activities were supported by direct combustion and liquefaction programs. The remaining 38 percent is associated with gasification projects (20 percent), demonstration plants (7 percent), and advanced coal technology (11 percent) of the coal program within Fossil Energy.

Nuclear Energy summary funding data is presented in Table III-5. As shown therein and in Figure III-6, the major portion of the ANE funding related to environmental control activities was in the area of commercial waste management of which 90 percent is estimated to be allocated.

Associated funding breakdowns and corresponding distributions for the Solar, Geothermal, and Advanced Energy Administration (ASGA) are depicted in Table III-6 and Figure III-7, respectively. Geothermal energy comprised 71 percent of the total FY 1977 funding related to environmetnal control technology within ASGA. The majority was in H_2S control, subsidence control, drilling technology, resource exploration and assessment, and hydrothermal technology applications. Solar energy activities in the environmental control technology area comprised 22 percent with advanced ASGA projects in the divisions of physical research and magnetic fusion making up the remaining 7 percent.

The office of the Assistant Administrator for Environment and Safety (AES) FY 1977 funding breakdown related to environmental control activities is shown in Table III-7 by divisional structure. The total was $17,973,000 of which the Division of Environmental Control Technology was responsible for 93 percent as shown in Figure III-8. The AES distribution within the main energy related sub-programs is shown in Table III-8 and depicted in Figure III-9. Within AES, nuclear related projects accounted for almost half (45 percent) with fossil energy related projects accounting for 33 percent of the environmental control related activities. The remainder was divided up into solar, geothermal, and advanced energy systems, conservation, and multi-technology which included the ECT efforts in the area of energy materials transportation. The distribution of environmental control related projects is shown in Figure III-9 with the management of surplus facilities and fossil projects accounting for the majority.

TABLE III-1

TOTAL DOE ENVIRONMENTAL CONTROL ACTIVITIES FUNDING ALLOCATIONS

Administration**	FY 1977 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1977 Budget Related tc Environmental Control Activities (Percent)*
Conservation (AC)	5,984	4.8
Fossil Energy (AFE)	86,194	19.4
Nuclear Energy (ANE)	62,195	2.5
Solar, Geothermal, and Advanced Energy Systems (ASGA)	12,337	1.4
Environment and Safety (AES)	17,973	8.1
Total	184,683	3.4

TOTAL DOE FY 1977 Budget: $5,383,982,000

* To nearest tenth of a percent

** National Security (ANS) excluded - See Section IV

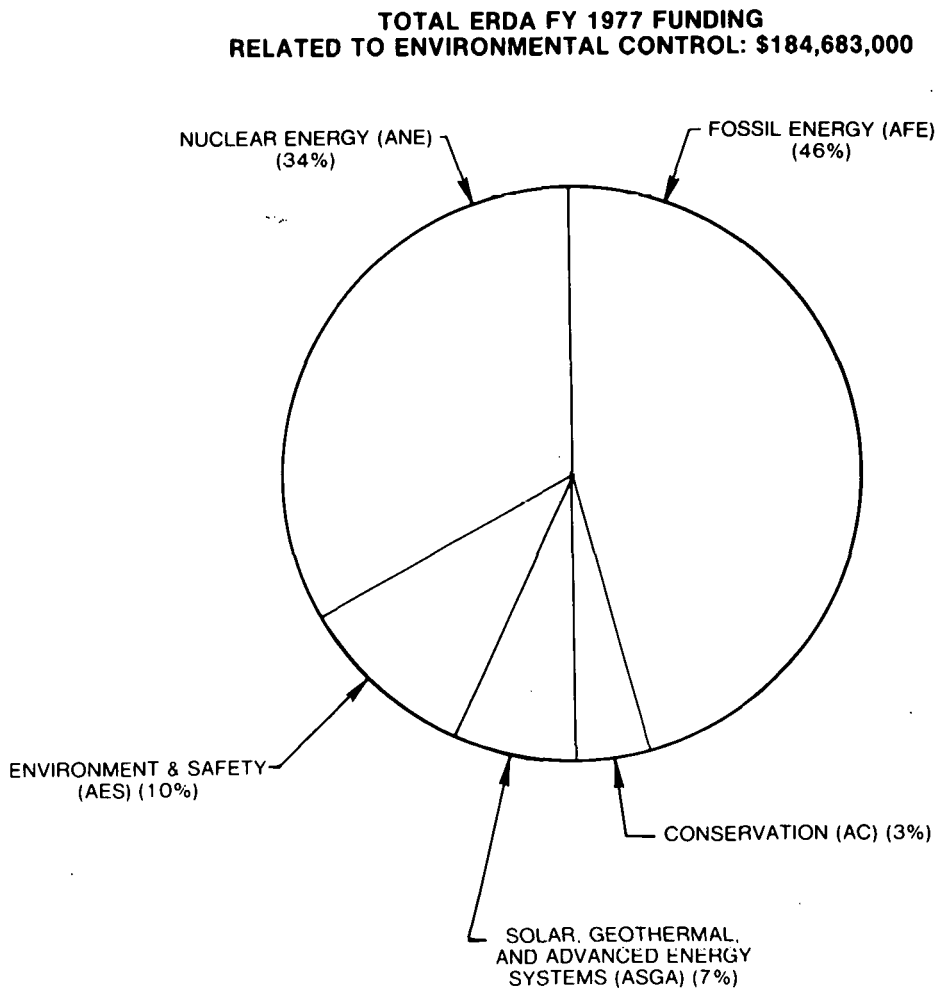


FIGURE III-1 Distribution of Total ERDA Environmental Control Activities Related to FY 1977 Funding by Administration.

TOTAL ERDA FY 1977 FUNDING
RELATED TO ENVIRONMENTAL CONTROL: $184,683,000

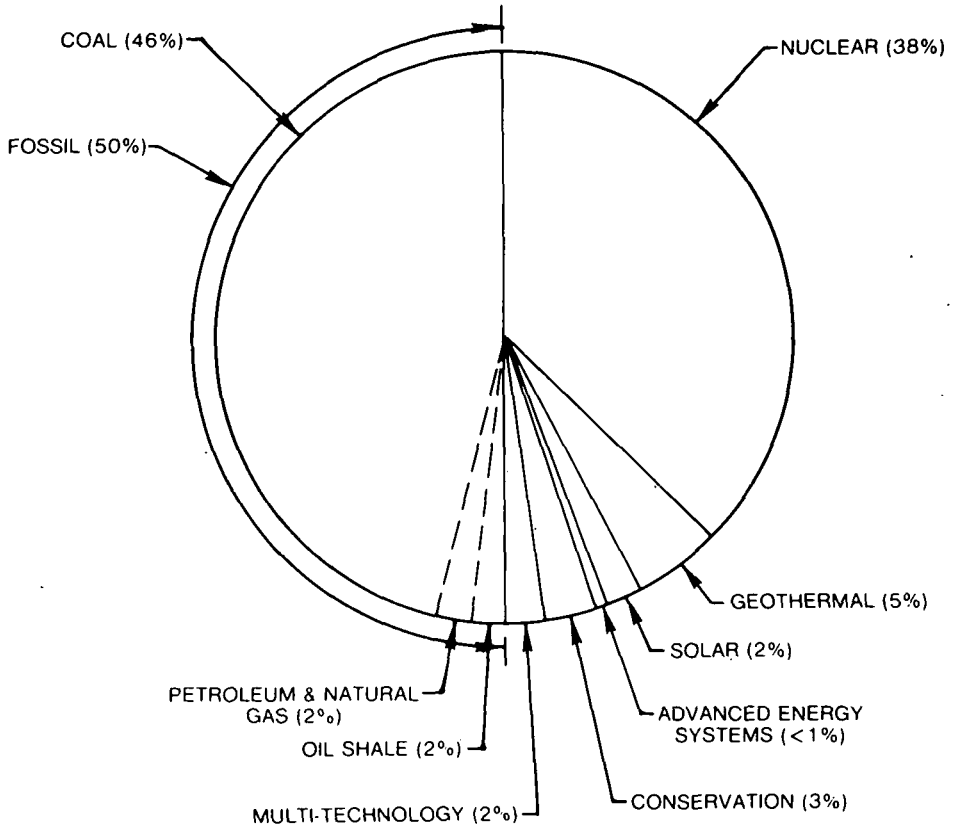


FIGURE III-2 Distribution of Total ERDA Environment Control Activities Related to FY 1977 Funding by Energy Category.

TABLE III-2

CONSERVATION ENVIRONMENTAL CONTROL ACTIVITIES RELATED FUNDING

Division or Sub-Program	FY 1977 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1977 Budget Related to Environmental Control Activities (Percent)*
Buildings & Community Systems	520	1.9
Conservation Research & Technology	813	6.4
Electric Energy Systems	2,817	13.6
Energy Storage Systems	909	3.3
Industrial Energy Conservation	413	3.3
Transportation Energy Conservation	512	2.1
Total	5,984	4.8

TOTAL AC FY 1977 Budget: $124,950,000

* To nearest tenth of a percent

TOTAL CONSERVATION FY 1977 FUNDING
RELATED TO ENVIRONMENTAL CONTROL: $5,984,000

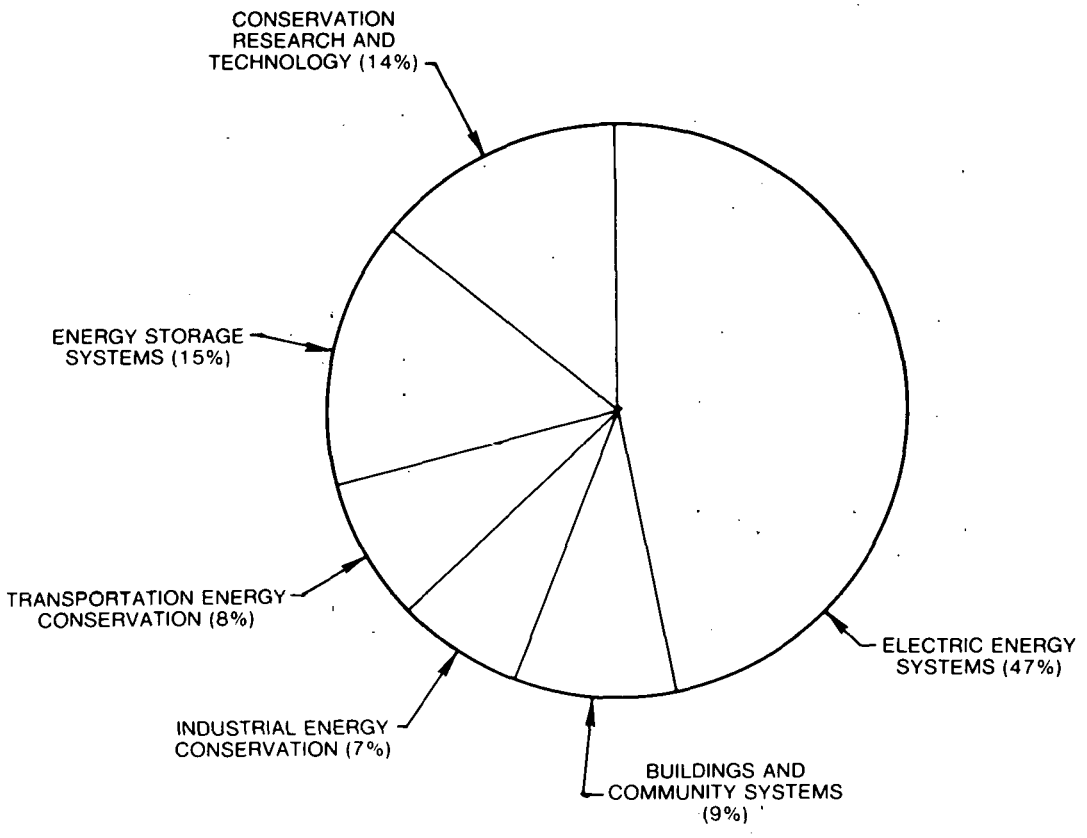


FIGURE III-3 Distribution of Environmental Control Technology Funding in the Office of the Assistant Administrator for Conservation.

TABLE III-3

FOSSIL ENERGY
ENVIRONMENTAL CONTROL ACTIVITIES RELATED FUNDING

Division or Sub-Program	FY 1977 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1977 Budget Related to Environmental Control Activities (Percent)*
Coal	81,897	20.0
Oil Shale and In Situ Technology	1,820	5.9
Petroleum and Natural Gas	2,477	5.7
Total	86,194	17.8

TOTAL AFE FY 1977 Budget: $483,145,000

* To nearest tenth of a percent

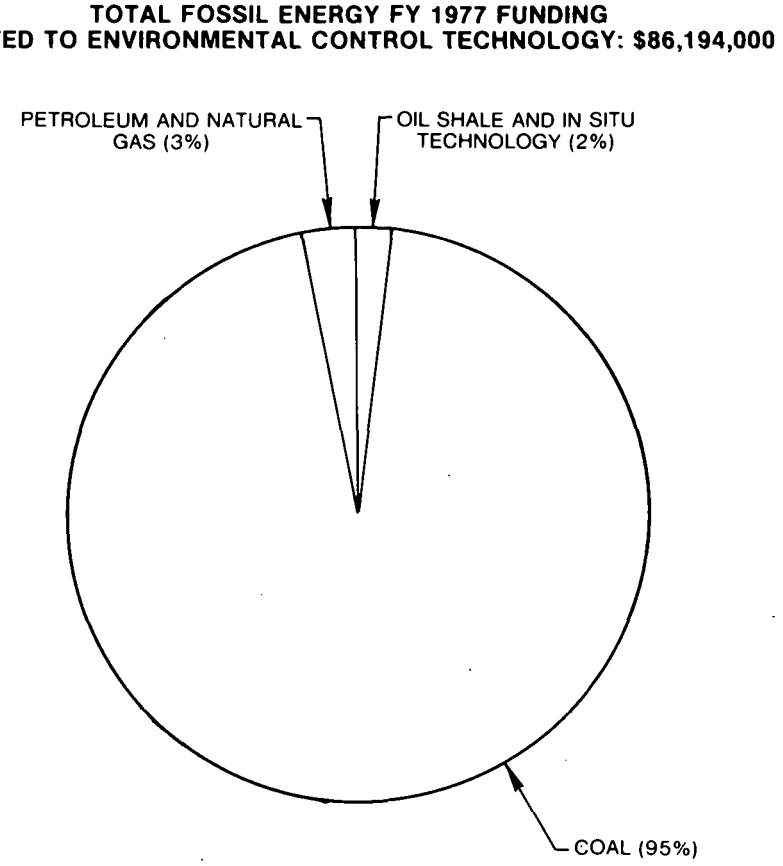


FIGURE III-4 Distribution of Environmental Control Technology Funding in the Office of the Assistant Administrator for Fossil Energy.

TABLE III-4

COAL PROGRAM
ENVIRONMENTAL CONTROL ACTIVITIES RELATED FUNDING

Coal Sub-Program	FY 1977 Funding Allocation Related Environmental Control Activities ($ in thousands)	Portion of Total FY 1977 Budget Related to Environmental Control Activities (Percent)*
Liquefaction	29,794	40.9
High-BTU Gasification	7,781	17.1
Low-BTU Gasification	8,231	24.9
Advanced Power Systems	1,769	7.9
Direct Combustion	20,782	40.0
Advanced Research & Support Technology	4,301	11.6
Demonstration Plants	5,795	10.9
Magnetohydrodynamics	3,444	9.8
Total	81,897	20.0

TOTAL AFE Coal Program FY 1977 Budget: $408,974,000

* To nearest tenth of a percent

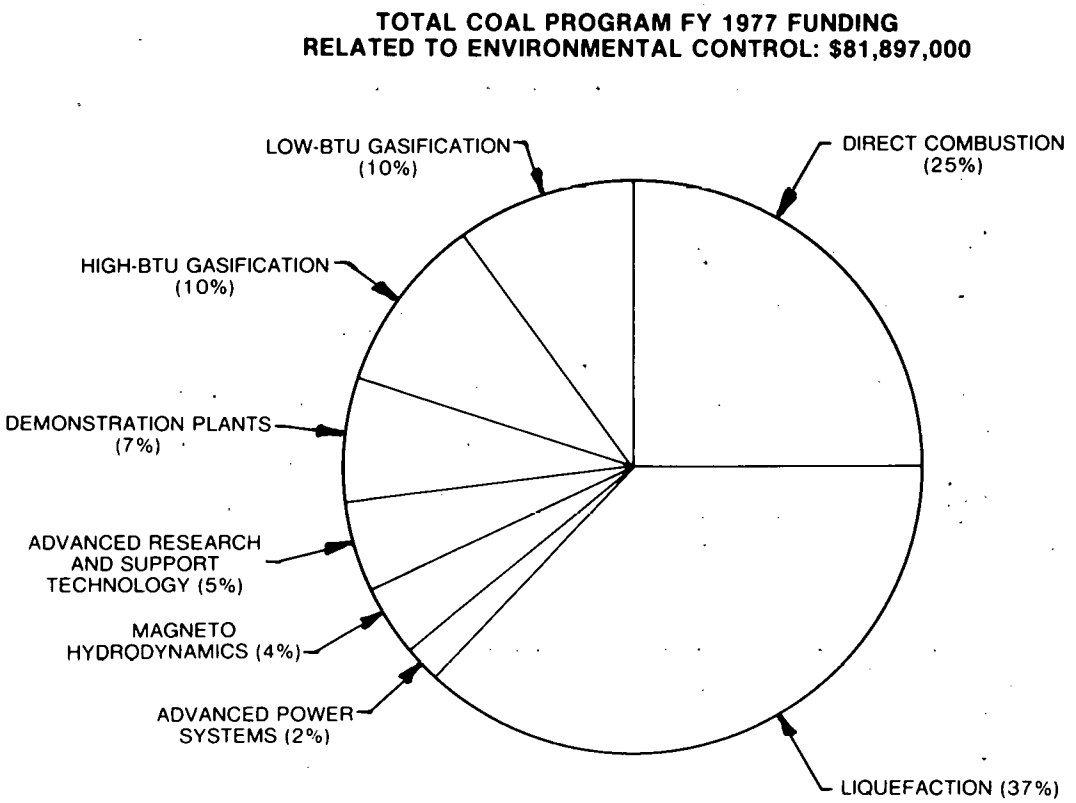


FIGURE III-5 Distribution of Environmental Control Technology Funding in the Coal Program within the Office of the Assistant Administrator for Fossil Energy.

TABLE III-5

NUCLEAR ENERGY
ENVIRONMENTAL CONTROL ACTIVITIES RELATED FUNDING

Division or Sub-Program	FY 1977 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1977 Budget Related to Environmental Control Activities (Percent)*
Naval Reactors	0	0
Nuclear Research and Applications	2,092	1.3
Reactor Development and Demonstration	4,078	0.7
Uranium Resources and Enrichment	0	0
Waste Management, Production, and Reprocessing	56,025	85.4
Total	62,195	2.5

TOTAL ANE FY 1977 Budget: $2,491,406,000

* To nearest tenth of a percent

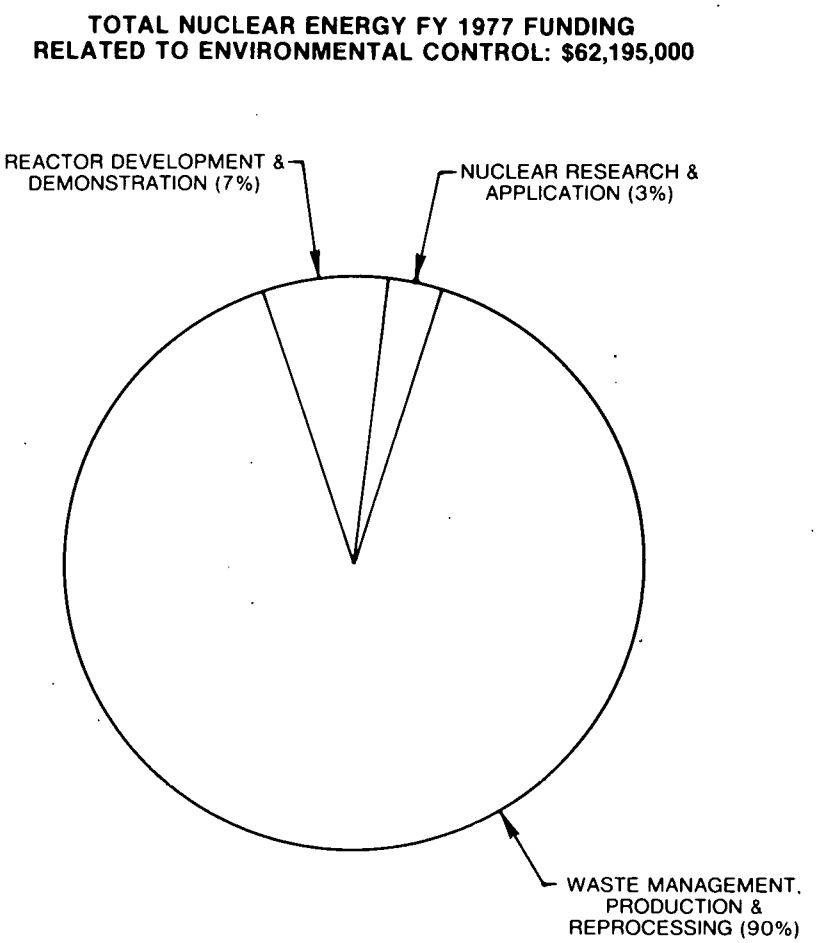


FIGURE III-6 Distribution of Environmental Control Technology Funding in the Office of the Assistant Administrator for Nuclear Energy.

TABLE III-6

SOLAR, GEOTHERMAL, AND ADVANCED ENERGY SYSTEMS
ENVIRONMENTAL CONTROL ACTIVITIES RELATED FUNDING

Division or Sub-Program	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)	Portion of Total FY 1977 Budget Related to Environmental Control Technology (Percent)*
Geothermal Energy	8,771	17.9
Magnetic Fusion Energy	780	0.3
Physical Research	100	0.1
Solar Energy	2,686	1.4
Total	12,337	1.4

TOTAL ASGA FY 1977 Budget: $874,910,000

* To nearest tenth of a percent

TOTAL SOLAR, GEOTHERMAL, AND ADVANCED ENERGY SYSTEMS FY 1977 FUNDING
RELATED TO ENVIRONMENTAL CONTROL TECHNOLOGY: $12,337,000

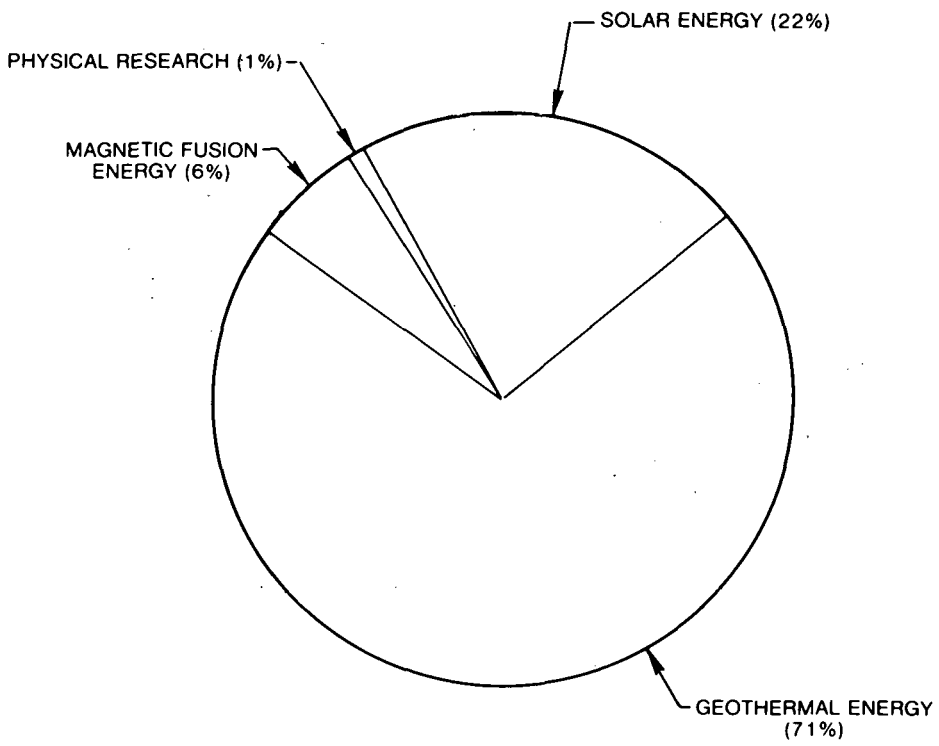


FIGURE III-7 Distribution of Environmental Control Technology Funding in the Office of the Assistant Administrator for Solar, Geothermal, and Advanced Energy Systems.

TABLE III-7

ENVIRONMENT AND SAFETY
ENVIRONMENTAL CONTROL ACTIVITIES RELATED FUNDING

Division or Sub-Program	FY 1977 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Portion of Total FY 1977 Budget Related to Environmental Control Activities (Percent)*
Biomedical and Environmental Research	1,196	0.7
Environmental Control Technology	16,777	100.0
Operational Safety	0	0
Reactor Safety Facilities	0	0
Total	17,973	8.1

TOTAL AES FY 1977 Budget: $222,819,000

* To nearest tenth of a percent

TABLE III-8

ENVIRONMENT AND SAFETY
BREAKDOWN OF FY 1977 FUNDING RELATED TO
ENVIRONMENTAL CONTROL ACTIVITIES

Energy Category	FY 1977 Funding Allocation Related to Environmental Control Activities ($ in thousands)	Apportionment of AES FY 1977 Funding For Environmental Control Activities (Percent)*
Conservation	316	2
Fossil Energy	(5,969)	(33)
Coal	3,551	20
Petroleum and Natural Gas	2,034	11
Oil Shale	384	2
Multi-Technology	2,737**	15
Nuclear	(8,157)	(45)
Nuclear Energy	1,802	10
Management of Surplus Facilities	6,355	35
Solar, Geothermal, and Advanced Energy Systems	794	5
Total	17,973	100

* To nearest whole percent

** Includes $2,330,000 for Energy Materials Transportation (13%)

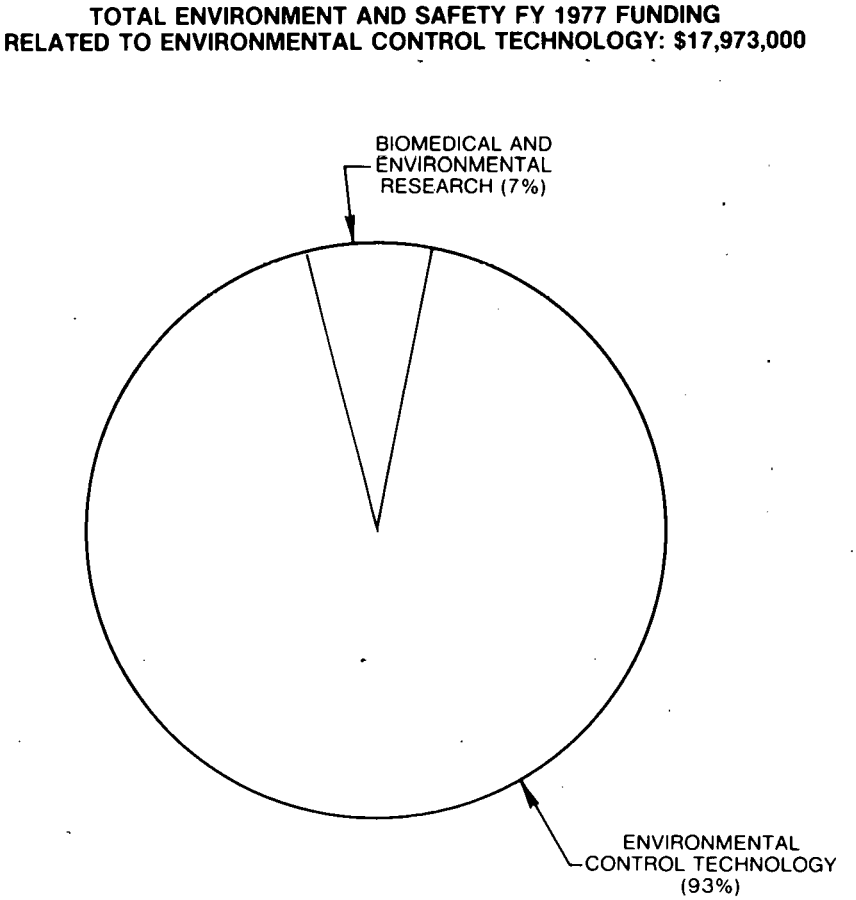
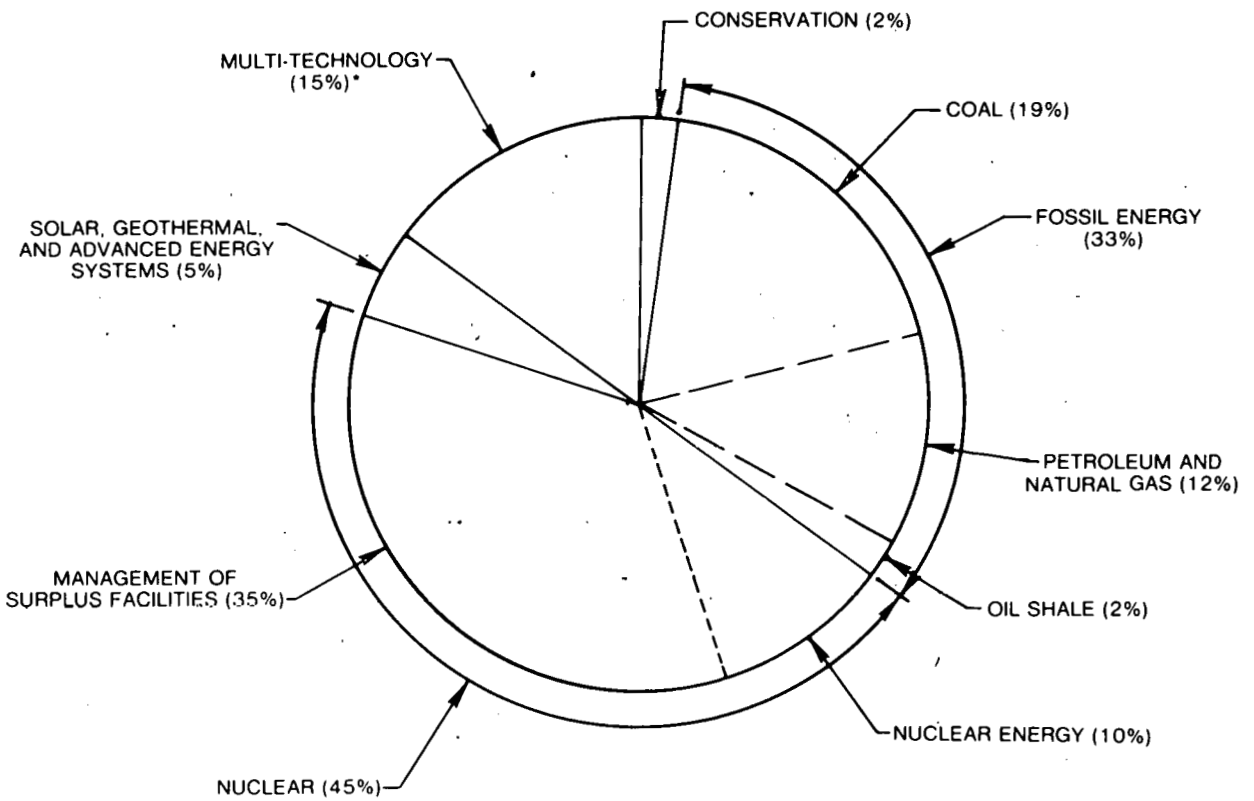


FIGURE III-8 Distribution of Environmental Control Technology Funding in the Office of the Assistant Administrator for Environment and Safety.

TOTAL ENVIRONMENT AND SAFETY FY 1977 FUNDING RELATED TO ENVIRONMENTAL CONTROL TECHNOLOGY: $17,973,000



*INCLUDES 13% FOR ENERGY MATERIALS TRANSPORTATION

FIGURE III-9 Distribution of Environmental Control Technology Funding by Energy Category in the Office of Assistant Administrator for Environment and Safety.

IV. Results

To aid in obtaining the necessary consistent inputs to the inventory, 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."

Examples:

- o Add-on Process (e.g., Claus Unit for Tailgas Cleanup)
- o Energy Process Design (e.g., Fluidized-Bed Combustion of Coal)
- o Energy Process "Tuning" Efforts (e.g., Reuse of Waste Water)

The criteria for activity applicability to environmental control was as defined in Table IV-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. A series of panel sessions was conducted to reconcile the vast majority of applicability uncertainties.

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

a. A heading defining the administration and the main title for the specific sessions.

b. "Project/Element" Title - 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 which are technology or subject interrelated.

c. A checklist to define the primary categories of the project and element relationship to environmental control technology such as research, studies, design, etc.

d. 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.

e. Finally, the FY 1977 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 sub-sections describe the detailed inputs obtained. Missing from the listings are inputs from National Security (ANS) for which it was agreed that attempting to include ANS projects would not serve the purpose of the inventory. This was due to the fact that an extremely small portion of their funding might have environmental control aspects.

TABLE IV-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

A. Conservation

Working meetings were held with the divisions within AC. Primarily these meetings were for the purpose of clarifying and defining the needs of the inventory and the requirements for completing the inputs. Each of the six divisions within Conservation submitted tabular data for review. Comments, as required, were coordinated and in all cases resolved. Tables IV-2 through IV-7 are the final product and constitute the AC portion of the environmental control technology inventory.

The total AC FY 1977 funding to environmental control activities was $5,984,000. The Division of Electric Energy Systems projects accounts for 47 percent of that total mainly due to three projects in the electric field effects of power lines. The division of Energy Storage Systems (STOR) and Conservation Research and Technology (CONRT) account for 15 percent and 14 percent of the AC funding respectively. The STOR project with the highest funding is associated with conducting research into containment materials for hydrogen storage and transport. Within CONRT, there is no particular project that stands out; however, the majority of the related funding was in the area of combustion and fuels technology research to improve emission controls or to decrease the emissions. The Divisions of Buildings and Community Systems (BCS), Industrial Energy Conservation (INDUS), and Transportation Energy Conservation (TEC) were approximately equally divided in their funding levels for the remaining 24 percent of the AC total. The total number of AC projects with environmental control aspects was over 70 with CONRT having the most at 21 and BCS with the least at 4.

The AC funding related to environmental control technology constituted 5 percent of the total FY 1977 funding for AC. The objectives of AC are basically reflected in the relatively low percentage. These 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 since it is directed towards 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 (less pollutants) or by the development of new techniques which more effectively utilize the available energy protentials. In either case, the control is by design and not as an add-on unit.

TABLE IV-2

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Conservation

PANEL SESSION: Buildings & Community Systems

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Pompano Beach - Methane from Waste					X			X	Reduction of solid waste and water pollution, 2%	30
NCRR Task Orders	X				X				Recovery of waste materials, 5%	40
ANFLOW Process	X		X			X			Reduction of water pollution, 85%	250
Activated Carbon for Sludge Digestion	X			X					Reduction of water pollution, 100%	200

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

TABLE IV-3

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Conservation

PANEL SESSION: Conservation Research and Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
FUEL CELLS										
Fuels Utilization		X							Residue Disposal, 15%	15
HEAT UTILIZATION										
High Grade Heat Utilization		X							Thermionic Converter Materials, 5%	10
Middle Grade Heat Utilization	X		X	X					Bottoming Cycle Working Fluids, 5%	35
Low Grade Heat Utilization		X							Reduction in Waste Heat, 5%	5
THERMODYNAMICS & HEAT TRANSFER										
Heat Pipes		X	X						Working Fluids, 35%	15
PLANNING AND ANALYSIS PREPARATION										
Environmental Development Plan Preparation		X							Prepare Environmental Development Plan, 100%	20
COMBUSTION AND FUELS TECHNOLOGY										
Internal combustion engine research	X								Emission Control, 100%	150
Study and development of catalyzed combustion	X								Emission Control, 100%	75
Boiler/furnace burner & industrial process heater improvement	X								Improved Emission Control, 75%	37.5
Efficient burner characterization by acoustic measurements	X								Decrease Emissions, 75%	19
Effect of turbulence on LASER instrumentation	X								Decrease Emissions, 50%	20
Wall quench and flammability limit effects on exhaust hydrocarbon emissions	X								Emission Control, 100%	50
Fuel injection studies for stratified charge rotary engines	X								Decrease Emissions, 50%	10

TABLE IV-3 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Conservation

PANEL SESSION: Conservation Research and Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Combustion optimization studies for stratified charge reciprocating engines	X								Emission Control, 100%	80
Rate of combustion of wood residue fuels	X								Reduction in Emissions, 50%	25
Development of laser spectroscopy for application to automotive gas turbine combustors	X								Reduction in Emissions, 75%	37.5
Development of criteria for electrical control of fuel injection in combustion of liquid fuels	X								Emission Control, 100%	65
Characterization of fundamental combustion parameters of alternate fuels	X								Reduction in Emissions, 50%	3.5
Fundamental and semiglobal kinetic mechanisms of hydrocarbon combustion	X								Emission Control, 100%	50
Air assisted fuel injection and ignition-a new concept to improve the automotive diesel engine	X								Emission Control, 100%	40
Lean engine efficiency and flammability limits: the influence of engine geometry via turbulence	X								Emission Control, 100%	50

TABLE IV-4

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Conservation

PANEL SESSION: Electric Energy Systems

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 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, 30%	123
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, 100%	550
Transmission Line Audible Noise Measurements	X	X	X	X	X	X			Investigate audible noise generated by EHV lines and relate to human response, 100%	173
Optimization of Transmission Line Support Systems	X		X	X		X			Minimize environmental impact of new support systems, 80%	275
HVDC Test Line - Electric Field Effects of DC Lines	X			X	X	X			Investigate Field Effects of DC Lines, 100%	1065
Determination of the Barriers and Incentives for Using Sodium Conductor Distribution Cable	X	X				X			Assess environmental barriers to use of sodium conductor cable, 100%	13
Animal Study	X	X		X	X	X			Study Electric Field Effects on Animals, 100%	500
Future Insulation System	X	X		X	X	X			Assess fire hazards of insulating fluids used to replace PCB's and other traditional fluids, 40%	38
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, 100%	80

Notes:
EHV - Extra High Voltage
HVDC - High Voltage Direct Current
DC - Direct Current
PCB - Polychlorinated Biphenyls

TABLE IV-5

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Conservation

PANEL SESSION: Energy Storage Systems

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 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, 2%	40
Sodium/Sulfur Battery Development	x		x		x				Conducting all rupture tests and designing measures to prevent the rapid mixing of reactants as well as vehicle crash safety measures, 4%	75
Zinc/Chlorine Battery Development	x		x		x				Designing and testing measures to prevent the possible leakage of chlorine and methods to recombine small quantities of hydrogen as well as vehicle crash safety designs, 10%	100
Batteries for EHV Act			x						Designing high voltage D.C. electrical safety measures, 10%	100
Environmental Impact Assessment of Electric and Hybrid Vehicle Batteries		x				x			Paper study assessing the environmental problems associated with batteries used in electric and hybrid vehicles, 100%	49
Aquifer Storage						x			This project may be funded prior to the end of FY 1977. It will assess the technical, socio-political, and environmental aspects of aquifer storage. This project will be jointly funded with BCS, 33%	10 (from STOR)
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%	350

TABLE IV-5 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Conservation

PANEL SESSION: Energy Storage Systems

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Thermochemical Hydrogen Production						x			Paper study assessing the toxicity of the zinc selenium cycle in the production of hydrogen, 1%	15
Flywheels	x	x	x	x		x			Paper study plus designing and developing safe composite flywheels for use in hybrid vehicles. Determination of failure mode of composite flywheels, 15%	170

Notes:

BCS - Division of Buildings and Community Systems
D.C. - Direct Current
EHV - Electric and Hybrid Vehicle
STOR - Division of Energy Storage Systems

TABLE IV-6

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Conservation

PANEL SESSION: Industrial Energy Conservation

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Automatic Boiler Fuel Control			X	X					Development and demonstration of automatic control systems for boilers. Intended to achieve complete combustion for energy efficiency and air emission reduction, 100%	155
Fuel Saving Paint Plant			X	X					Process redesign, development, and demonstration to use unburned solvent vapors as fuel, thus improving energy efficiency and reducing emissions, 10%	30
Cupola Furnace Modifications			X	X					Process redesign, development, and demonstration to improve energy efficiency and reduce emissions, 25%	23
Coal Fired Aluminum Remelt			X	X					Development and demonstration of burner for coal firing; design for energy efficiency and reduced emissions, 25%	100
Slot Forge Furnace			X	X					Development and demonstration of furnace modifications to improve energy efficiency and to reduce emissions, 10%	16
Glass Conglomerates			X	X					Design, development, and demonstration of new furnace to reduce emissions and to save fuel, 75%	75* (Indus.)
New Fertilizer Process			X	X					Process redesign, development and demonstration to improve energy efficiency and reduce emissions, 10%	14

*Joint funding with EPA

TABLE IV-7

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Conservation

PANEL SESSION: Transportation Energy Conservation

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Low Emission Advanced Combustors	X	X							To Evolve and Evaluate Advanced Combustor Concepts, 33%	223
Variable Displacement Engine		X			X				Emission Analysis as a result of Engine Mapping, 15%	30
Rankine Bottoming		X			X				Emissions testing as part of prototype development, 10%	70
Combustion Research Center	X								By going to higher temperature for external combustion engines--lower emissions, 10%	20
Investigation of Alcohol/Gasoline Blends	X					X			Assessment of emissions, including unregulated, 100%	40
Characterization of Alcohol/Gasoline Blends						X			Assessment of emissions, including unregulated, 10%	25
Investigation of Methanol Fuel	X								Emissions and effects; ecology, 30%	30
Modification of Alcohol Fuels	X								Emissions, toxicological effects, 5%	12
Modification of Engine to Use Alcohol		X							Emission effects, 5%	5
Composition of Shale & Coal Fuels		X							Interaction of emissions/regulations, 10%	10
Refueling of Vehicular Hydride Storage			X						Directly impacts handling health & Safety, 100%	37
Design Data for Hydrogen Engine	X								Design influence on emissions, 10%	10

B. Fossil Energy

At their request, panel sessions with AFE were not held. Inputs to this inventory were received from AFE and are shown in Table IV-8 through IV-21 inclusive. The format is slightly different from the remainder of the report due to time limitations and AFE commitment conflicts.

In the AFE supplied tables a description of the portion of the category related to environmental control technology was not presented, therefore a detailed description of the environmental control activities is not possible. The major portion of the applicable funding was in the coal program which comprised 95 percent of the total AFE funding related to environmental control activities. The remaining 5 percent was associated with petroleum and natural gas (3 percent) and oil shale and in-situ technology (2 percent).

Within the coal program, liquefaction accounted for 37 percent of the total AFE related funding with solvent extraction processes ($21,150,000), followed by direct hydrogenation processes ($6,340,000) accounting for the majority of the liquefaction project activities related to environmental control technology. Direct combustion followed with 25 percent of the AFE total mainly in the areas of atmospheric fluidized-bed combustion ($10,582,000) and pressurized systems ($8,600,000). Gasification (high and low BTU) accounted for 20 percent, with the major funding related to environmental control technology noted in the development of gasification techniques and processes. The remainder (18 percent) of the coal program environmental control activities were , in the order of funding levels, associated with demonstration plants ($5,795,000), advanced research and support technology ($4,301,000), magnetohydrodynamics ($3,444,000), and advanced power systems ($1,769,000).

The petroleum and natural gas program (Tables IV-16 through IV-19) accounted for 3 percent ($2,477,000) of the total AFE funding related to environmental control technology. The environmental control activities in this program are almost entirely related to environmental studies and support.

The oil shale and in-situ technology program, Tables IV-20 and IV-21, comprised the remaining 2 percent ($1,820,000) of the AFE funding related to environmental control technology. These activities are all in the category of environmental support and supporting research.

TABLE IV-8

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Coal

SUBPROGRAM: Liquefaction

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Direct Hydrogenation		X			X	X			20%	6,340
b. Solvent Extraction	X	X	X	X	X	X	X	X	86%*	21,150
c. Pyrolysis								X	10%	540
d. Indirect Liquefaction								X	5%	55
e. Support Studies and Engineering Evaluations		X			X	X			17%	1,709

* Coal Cleaning via SRC associated with environmental control requirements.

TABLE IV-9

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Coal

SUBPROGRAM: High-Btu Gasification

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Development of Second Generation Gasification Techniques								X	20%	6,772
b. Support Studies and Engineering Evaluations		X	X		X	X			10%	1,009

TABLE IV-10

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Coal

SUBPROGRAM: Low-Btu Gasification

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Gasification Processes			X		X				20%	5,530
b. Support Studies and Engineering Evaluations		X			X	X			50%	2,701

TABLE IV-11

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Coal

SUBPROGRAM: Advanced Power Systems

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Open Cycle Gas Turbine								X	5%	820
b. Closed Power Systems								X	5%	144
c. Support & Additional Projects		X			X	X			25%	805

TABLE IV-12

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Coal

SUBPROGRAM: Direct Combusion

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Fluidized-Bed Boiler, Atmospheric*			X					X	50%	10,582
b. Pressurized Systems*			X					X	50%	8,600
c. Coal Oil Slurries								X	5%	215
d. Support Studies and Engineering Evaluations		X			X	X			15%	1,385

*See Special Cases.

TABLE IV-13

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Coal

SUBPROGRAM: Advanced Research & Support Technology

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Materials & Components								X	5%	429
b. Processes								X	5%	760
c. Direct Utilization		X			X				10%	554
d. Program Development & Coordination				X	X				33%	2,558

TABLE IV-14

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Coal

SUBPROGRAM: Demonstration Plants

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Clean Boiler Fuel Demonstration Plant		X				X			20%	0
b. High-Btu Synthetic Pipeline Gas Demonstration Plant		X							20%	2,000
c. Low-Btu Fuel Gas Demonstration Plant		X							20%	2,400
d. Low-Btu Fuel Gas Small Industrial Demonstration Plants								X	20%	0
e. Direct Combustion Demonstration Plant*								X	50%	0
f. Design & Technical Support		X				X			4.5%	1,395

*See Special Cases (fluidized bed boilers).

TABLE IV-15

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Coal

SUBPROGRAM: Magnetohydrodynamics

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Open Cycle Systems								X	10%	3,389
b. Closed Cycle Systems								X	5%	55

TABLE IV-16

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Petroleum & Natural Gas

SUBPROGRAM: Enhanced Oil Recovery

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Studies & Support in the Areas of: a. Micellar - Polymer Process b. Carbon Dioxide Flooding c. Improved Waterflooding d. Thermal Recovery	X					X			25%	1,320

TABLE IV-17

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Petroleum & Natural Gas

SUBPROGRAM: Enhanced Gas Recovery

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Studies & Support in the Areas of: a. Massive Hydraulic Fracturing b. Chemical Explosive Fracturing c. Deviated Wells d. Resource Characterization		X				X			85%	765

TABLE IV-18

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Petroleum & Natural Gas

SUBPROGRAM: Drilling, Exploration & Offshore Technology

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental & Advanced Concepts Support in Drilling and Exploration	X	X						X	50%	300

TABLE IV-19

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Petroleum & Natural Gas

SUBPROGRAM: Processing & Utilization

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Total dollars apply across all projects in this subprogram. It is impractical to list individual projects.								X	5%	92

TABLE IV-20

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Oil Shale & In Situ Technology

SUBPROGRAM: Oil Shale

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
a. Environmental studies in shale oil and gas production	X	X			X				100%	1,168
b. Supporting Research in shale oil and gas production		X							10%	152

TABLE IV-21

ENVIRONMENTAL CONTROL ASPECTS OF FOSSIL ENERGY PROGRAM

PROGRAM: Oil Shale & In Situ Technology

SUBPROGRAM: In Situ Coal Gasification

Category	Check Applicable Environmental Control Aspects								Portion of Category Funding Related to Environmental Control Technology	FY 1977 Funding Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Support in the Areas of: a. Linked Vertical Wall/ Medium Thick Seams b. Packed Bed/Thick Seams c. Longwall Generator/Thin Seams d. Steeply Dipping Beds		X			X	X			100%	500

C. Nuclear Energy

The Nuclear Energy (ANE) inputs to this inventory are contained in Tables IV-22 through IV-24. The total ANE funding associated with environmental control technology was $62,195,000. Waste management, production and reprocessing accounted for 90 percent ($56,025,000) of that total with the major projects being the national waste terminal storage program, commercial High Level Waste (HLW) vitrification, and the radioactive waste demonstration program as shown in Table IV-24.

Reactor development and demonstration environmental control activities are depicted in Table IV-23 and constituted 7 percent of the ANE total related funding ($4,078,000). The largest project, in terms of funding, was in the area of radioactivity control technology. Sodium processing and tritium behavior and control were significant activities with four separate projects. Meteorological studies, jointly funded with the National Oceanic and Atmospheric Administration (NOAA), were also a significant environmental control activity.

Table IV-22 lists the Nuclear Research and Application environmental control activities. These comprised the remaining 3 percent ($2,092,000) of the total ANE funding related to environmental control technology. The projects fall into the categories of effluent control, radioactive material handling, waste heat recycling, diffusion studies, environmental impact assessments, and nuclear fuel behavior safety studies.

TABLE IV-22

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Nuclear Energy

PANEL SESSION: Nuclear Research and Applications

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Engineering Analysis and Development of an Advanced Technology Low Cost Dry Cool Transfer Surface	X	X		X		X			All (Effluent Control)	147
Advanced Wet/Dry Cooling Tower Concept	X	X		X					All (Effluent Control)	15
Study Support for Energy Center		X				X			All (Handling)	275
Nuclear Energy Center Evaluation		X			X	X			All (Handling)	150
Desalting Dual Purpose Plant Coupling and Control	X	X				X			All (Recycle)	65
Analysis of Submerged Diffusor Discharges	X	X				X			All (Effluent Control)	150
Benoficial Uses of Waste Heat	X	X				X			All (Recycle)	125
District Heating Studies	X	X				X			All (Recycle)	100
Chalk Point Cooling Tower Study	X	X			X	X			All (Diffusion Studies)	50
Atmospheric Efforts of NEC's	X	X			X	X			All (Effluent Control)	400
VHTR Environmental Assessment	X	X				X			All (Environmental Impact)	30
Environmental Radiation Safety	X	X				X			Nuclear Fuel Behavior (One-third)	40
Advanced Safety Technology	X	X		X		X			Nuclear Fuel Behavior (One-third)	425
Safety Support	X	X				X			Diffusion Studies (One-third)	120

Notes:
NEC - Nuclear Energy Center
VHTR - Very High Temperature Reactor

TABLE IV-23

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Nuclear Energy

PANEL SESSION: Reactor Development and Demonstration

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 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			All	298
Evaluation of Army Meteorological and Diffusion Data		x							All	50
Evaluation of Models for Assessment of LMFBR Radioactivity Releases		x				x			All	214
Tritium Control in LMFBR Systems	x	x	x	x	x				All	58
Sodium Processing and Tritium Behavior	x	x	x		x	x			All	380
Meteorological Studies - NOAA*	x	x			x				(~80%) Diffusion Studies	200
LMFBR Radiological Dose Assessment Code Improvements		x				x			All	43
Radiation and Effluent Control Technology	x	x	x	x	x	x			(~50%) Effluent Control Technology Portion	225
FFTF Operations and Training					x	x	x		(~4%) Environmental Control Equipment Use Training	200
Fuel Failure Monitoring	x	x	x			x	x		(~50%) Effluent Control Technology	155
Radioactivity Control Technology	x	x	x			x			All	700
Decontamination of LMFBR Components	x		x						All	217
FFTF Test Engineering						x			(~5%) Preparation of Instructions for Environmental Control Equipment Use	170

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

TABLE IV-23 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Nuclear Energy

PANEL SESSION: Reactor Development and Demonstration

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Decontamination Process Development	x		x						All	163
Radioactive Waste System			x			x			All	293
Waste Water Treatment System			x			x			All	102
Inert Gas Receiving and Processing System			x	x		x			All	275
Intake Design			x			x			All	5
Environmental Effects of Advanced LMFBR Fuels	x	x			x	x			All	130
Tritium Control in LMFBR Systems	x	x	x	x	x				All	30
Sodium Processing and Tritium Behavior	x	x	x		x	x			All	70

TABLE IV-24

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Nuclear Energy

PANEL SESSION: Waste Management, Production and Reprocessing - Commercial Waste Program

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Ultrafiltration/Inorganic Absorption	x			x					R&D on separation techniques for removal of particles, pollutants and heavy metals from waste streams	370
Fluidized-Bed Incineration				x					Development of fluidized bed incinerator for incineration of contaminated radioactive fuel cycle waste	470
Encapsulation of HLW in Metal				x					Selection of metal matrix waste form and process and preparation of conceptual design of plant facility	400
Criteria for Hull Treatment				x					Specify criteria and identify suitable forms and packaging	190
Krypton Deep Well Disposal	x			x					Development of concept of storing fission product noble gases (solution and gas phases) in deep wells	75
Fluid Bed Calcination and Post Treatment Waste Characterization				x					Waste form development, process engineering development, equipment design verification	500
Molten Salt Incineration			x	x					Design, constructing, and operation of prototype full full scale combustor	500
National Waste Terminal Storage Program (NWTS)	x	x	x	x					Program management, geological studies, engineering construction	38,200
Removal and Segregation of Nuclides (ILW)	x			x					R&D on methods to separate TRU and other radioactive nuclides from ILW and HLW liquid waste streams	790
Volume Reduction and Resource Recovery				x					Establishment of feasibility of reuse of contaminated metals from a molten metal alloy	300
Controlled Air Incineration	x			x					Testing and review of existing and prototype incineration systems	550
Commercial HLW Vitrification				x					Development of spray calcination/in-can glassification technology	5,950
ILW Solidification	x			x					R&D on economic techniques for solidification of large volumes of ILW	1,750
Acid Digestion of Solid Waste				x					Development of methods for production of radioactive waste without altering the product	500
Immobilization and Fixation of TRU Waste		x		x					Studies on fixation of incinerator ash residues and resins by vitrification, cement and glass techniques	300

TABLE IV-24 (Cont)
PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Nuclear Energy

PANEL SESSION: Waste Management, Production and Reprocessing - Commercial Waste Program

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Off Gas Monitoring	x			x					Development and operation of gaseous monitoring instruments	135
C-14 and I-129 Fixation	x			x					Evaluation of options for solidification and/or fixation of C-14 and I-129	135
Krypton Solidification	x			x					Study feasibility of the glass and metal foil fixation process	210
Radioactive Waste Demonstration Program	x	x	x	x					To demonstrate glass fixation process on HLW from reprocessing spent LWR fuel	4,400
Volume Reduction System for TRU Waste		x		x					Studies to evaluate feasibility of adapting the cyclone incinerator for processing radioactive contaminated waste	300

Notes: R&D - Research and Development
HLW - High Level Waste
ILW - Intermediate Level Waste
TRU - Transuranic Waste
LWR - Light Water Reactor

D. Solar, Geothermal, and Advanced Energy Systems

The environmental control activities within the Office of the Assistant Administrator for Solar, Geothermal, and Advanced Energy Systems (ASGA) accounted for $12,337,000, or 7 percent, of the total ERDA related funding. Of the $12,337,000, Geothermal energy development, with $8,771,000, comprised the majority (71 percent) of the ASGA funding related to environmental control technology. The geothermal projects are shown in Table IV-25. There were over seventy projects listed with the prime emphasis on H_2S control, subsidence control, drilling technology, resource exploration and assessment, and hydrothermal technology applications.

The environmental control activities in solar energy development are shown in Table IV-28 and amount to $2,686,000 or 22 percent of the ASGA total funding associated with environmental control technology. There were almost 60 projects with partial or total environmental control aspects. They covered all of the sub-programs within solar energy which are: heating and cooling; thermal power systems; photovoltaics; and biomass, ocean, and wind systems.

The remaining 7 percent of the total ASGA funding related to environmental control technology was in the categories of magnetic fusion energy and physical research. The former constituted $780,000 for the majority of the 7 percent remainder with primary emphasis on tritium containment, control permeation studies, and cleanup systems as denoted in Table IV-26. Physical research activities with $100,000 in associated funding are shown in Table IV-27. As noted, there were no separately identified projects. Some design and minor development efforts were associated with environmental control technology in the six line item construction projects listed therein.

TABLE IV-25

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, and Advanced Energy Systems

PANEL SESSION: Geothermal Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Acoustical Drill Monitoring		x	x						Environmental Data Monitoring, 15%	6.75
Electromagnetic Signal Transmission		x	x						Environmental Data Monitoring, and Transmission, 15%	14.4
Descaling Techniques		x	x	x	x				Determination of Scale Composition, 25%	50.0
High Temperature Drilling Fluid				x					Development of Nontoxic Drilling Fluids, 15%	14.85
Drilling Fluid Instrument (test bed)	x	x	x						Development of Nontoxic Drilling Fluids, 25%	37.5
Electronic Circuits		x	x	x					Environmental Data Monitoring and Transmission, 10%	22.0
Computer Model Brine/Mineral System	x			x				x	Model Fluid Thermodynamics, 75%	93.75
Concrete Polymer Composite Material				x					Material Development to Increase Well Safety, 50%	90.0
High Temperature Polymer Well Cement	x			x					Well Material Development to Improve Integrity, 15%	39.0
High Temperature Inorganic Cement	x			x					Well Material Development to Improve Integrity, 15%	25.05
Corrosivity of Brines	x			x	x				Determination of Corrosion Rates, 50%	112.5
Precipitation and Scaling	x		x	x	x				Waste Materials Control, 50%	150.0
Iron Base Alloys vs Alternate Materials	x		x	x	x				Materials Corrosion Analysis, 10%	32.5
Standardized Fluid Analysis Techniques		x	x	x	x	x			Fluid Composition Determination, 100%	340.0
Downhole Fluid Analysis	x	x	x	x	x	x			In-Situ Fluid Composition Analysis, 50%	180.0
Silica Precipitation and Brine Management	x	x			x	x			Waste Materials Control, 75%	75.0
Well Completion Evaluation		x	x	x					Well Completion Safety and Technique Evaluation, 15%	64.65
In Service Drill Pipe			x	x					Test of Pipe Materials for Failure Rates, 25%	46.5
Materials Identification		x	x			x			Materials Design Specifications, 50%	47.5
Materials for Corrosive Environment	x			x					Bore Hole Material Evaluation and Development, 15%	7.5
Study of Injection	x	x	x						Waste Disposal, Analysis, 50%	25.0
Corrosion Fatigue of Geothermal System				x					Baseline Materials Development, 10%	10.0

TABLE IV-25 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, and Advanced Energy Systems

PANEL SESSION: Geothermal Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
High Temperature Inorganic Cement	x								Well Materials Development to Improve Integrity, 15%	37.5
Conversion Systems - Site Specific Analysis		x	x			x			Site Specific Environmental Consideration in Conversion Systems Design, 100%	199.0
Rock Mechanics	x	x			x				Determination of Reservoir Rock Properties, 50%	131.5
Geothermal Well Logging Device				x					Data Acquistion and Instrumentation Development, 30%	135.0
Improved Logging Tools				x					Data Acquisition and Instrumentation Development, 10%	18.8
Mechanical Refrigerator				x					Data Acquisition and Instrumentation Development, 10%	14.0
Ultra High Temperature Amplifier				x					Data Acquisition and Instrumentation Development, 10%	18.3
Log Interpretation	x	x							Reservoir Properties Determination, 20%	40.0
Passive Electronic Components - Well Logging				x					Data Acquisition and Instrumentation Development, 10%	20.2
Liquid Dominated Reservoir Analysis	x	x			x				Analysis of Reservoir Conditions and Behavior, 10%	12.0
Resistivity of Rocks	x	x			x				Determination of Reservoir Rock Properties, 10%	6.0
Raft River Core and Log Interpretation		x			x				Measuring of Reservoir Rock Properties, 10%	8.0
Reservoir Analysis and Modeling	x	x							Modeling of Reservoir Properties and Performance, 25%	87.5
Reservoir Engineering Support		x			x				Measuring of Reservoir Properties and Performance, 15%	15.0
Subsidence Study Cerro Prieto		x			x	x			Determination and Evaluation of Subsidence, 100%	150.0
Reservoir Engineering Management	x	x							Management of Reservoir Engineering Prog., 50%	75.0
Reservoir Engineering Techniques	x			x					Testing of Reservoir Assessment Tools and Techniques, 50%	50.0

TABLE IV-25 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, and Advanced Energy Systems

PANEL SESSION: Geothermal Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Passive Seismic Data Analysis		x							Study of Seismicity Associated with Geothermal Reservoirs, 25%	36.0
Numerical Modeling of Subsidence	x	x		x		x			Evaluation of Subsidence Potential, 100%	75.0
Reservoir Prospective Model		x		x					Reservoir Model Development, 75%	142.5
Reservoir Engineering Subcontracts (LBL)	x	x	x		x				Reservoir Properties and Performance Studies and Sample Analysis Techniques, 25%	170.5
Low Temperature Reservoir Assessment	x	x	x		x	x			Reservoir Properties and Performance Studies and Sample Analysis Techniques, 5%	42.8
Subsidence Study - Cerro Prieto #2		x			x				Determination and Evaluation of Subsidence, 100%	100.0
COSO Site Assessment		x				x			Environmental Factors — In Site Evaluation, 25%	325.0
COSO Support								x	General Program Support, 10%	15.0
High Temperature Resource Industrial Support		x			x	x			Environmental Support of High Temperature Development, 20%	300.0
High Temperature/High Salinity Test Facility Management				x				x	General Development Support, 20%	35.0
High Temperature Reservoir Engineering	x	x			x				Reservoir Properties and Performance, 5%	8.5
GC Test Facility			x	x		x			Design and Evaluation of Environmental Control Systems, 10%	99.0
Geothermal Test Loop	x	x		x	x	x			Evaluation of Control Technology, 15%	126.75
Power Plant Component Tests					x	x			Environmental Compatability Tests, 40%	620.0
High Temperature/High Salinity Test Facility				x	x	x			Testing of Environmental Control Components, 20%	50.0
Thermal Loop Turbine Conversion			x	x		x			Environmental Analysis and Design, 10%	75.0
Geopressure Static and Dynamic Well Tests				x	x				Fluid Analysis and Reservoir Evaluation, 15%	734.25
Geopressure Rock Mechanics	x	x							Determination of Reservoir Rock Properties, 75%	375.0
Hot Dry Rock Technology Development		x	x		x	x			Environmental Support Studies and Environmental Design Considerations in Technology Development, 5%	250.7

TABLE IV-25 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, and Advanced Energy Systems

PANEL SESSION: Geothermal Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
INEL Environmental Monitoring	x	x			x	x			Baseline Monitoring and Environmental Assessment, 10%	29.0
Subsidence Control Program	x	x	x	x	x	x			Subsidence Research and Control Technology, 100%	500.0
H_2S Control — Steam Scrubbing	x	x	x	x	x	x			H_2S Control Technology — Steam Scrubbing, 100%	268.0
H_2S Control — Oxygen Injection	x	x	x	x	x	x			H_2S Control Technology — Brine Oxidation, 100%	300.0
H_2S Control Pilot Test Facility	x		x	x	x	x			H_2S Control Technology — Steam Scrubbing, 100%	500.0
Well Blow Out Control Analysis		x				x			Study and Assess Well Blow Out Control, 100%	50.0
Induced Seismic Studies	x	x							Study and Evaluation of Induced Seismic Potential Related to Geothermal Development, 100%	100.0
H_2S Control — Undesignated	x	x	x	x	x	x			H_2S Control Technology, 100%	100.0
Noise Control		x				x			Study and Assess Noise Control Technology, 100%	50.0
EIA/EIS Evaluations						x	x		NEPA Environmental Reviews, 10%	46.0
Raft River Thermal Loop Facility			x	x	x				Environmental Control Systems Design and Environmental Sampling, 15%	660.0
Raft River Non-electric Applications		x				x			Environmental Studies and Assessments, 15%	30.0
Moderate Temperature Reservoir Engineering		x							Reservoir Behavior, 10%	5.0
Hawaii Geothermal Project	x	x			x	x			Environmental Monitoring, Effects, and Evaluation, 20%	50.0

Notes:
LBL - Lawrence Berkeley Laboratory
GC - Gulf Coast
EIA - Environmental Impact Assessment
EIS - Environmental Impact Statement
INEL - Idaho National Engineering Laboratory
NEPA - National Environmental Policy Act

TABLE IV-26

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, and Advanced Energy Systems

PANEL SESSION: Magnetic Fusion Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 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 Prototype Experimental Power Reactor to be operated in the mid 1980's. Approximately 20% of the FY'77 budget is committed to containment and control technology development.	200 (OP) 100 (EQ)
2. Alloy Development	x								Approximately 5% of this program element in FY'77 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.	140 (OP)
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 6% of the FY'77 budget for this program element is being applied to evaluating the waste management implications of fusion power.	25 (OP)
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'77 project budget.	150 (PACE) 15 (OP)
2. Rotating Target Neutron Source Facility				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 10% of the FY'77 project budget.	75 (PACE) 75 (OP)

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

TABLE IV-27

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal and Advanced Energy Systems

PANEL SESSION: Physical Research

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
DIVISION OF PHYSICAL RESEARCH			x	x					The Division has underway in FY 1977 six line items construction projects. Although none of these involves separately identified R&D concerning environmental control technology, some design and minor development efforts are properly associated with environmental control in each case. The thrust of the work of this type is to assure fully adequate use of existing environmental control technologies. The projects underway are: (1) SuperHILAC Initial Upgrading, LBL (2) Holifield Heavy Ion Research Facility, ORNL (3) Positron-Electron Project (PEP), SLAC (4) High Flux Beam Reactor (HFBR) Power Increase, BNL (5) Steam Plant Modifications, ORNL (6) Bates Linear Electron Accelerator, 2nd Experimental Area, MIT	Estimated $ 100

TABLE IV-28

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, & Advanced Energy Systems

PANEL SESSION: Solar Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Existing Systems that require additional development				X		X			Flame & toxic gas barrier to be added, 10% Double-wall approach	31
Existing Systems that require additional development				X		X			Develop double-wall approach to eliminate, 10% contamination	7
Environmental Impact Assessment of solar heating and cooling program						X			Determine significant environmental effects, 65%	3
Mission Analysis of photovoltaic energy systems		X							Investigate environmental aspects, 5%	21
Improved Semiconductors for photovoltaic solar cells (coevaporation of $CuInSe_2$ 1.01ev)				X	X				Measure toxicity, 5%	4
Improved Semiconductors for photovoltaic solar cells				X	X				Measure toxicity, 5%	12
Conceptual Design and 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
Improve Semiconductors for photovoltaic solar cells				X	X				Measure toxicity, 5%	7
Conceptual Design and systems analysis of photovoltaic solar energy systems						X			Preliminary Assessment of environmental Issues, 5%	20
Conceptual Design and systems analysis of photovoltaic solar energy systems						X			Preliminary Assessment of environmental Issues, 5%	26
Community workshops to assess environmental and social effects						X	X		Assessment of environmental issues	10
Technology Assessment of solar energy studies						X			Assessment of environmental issues	20
Desert Ecology impacts study	X					X			Identification of impacts, formulation of research plan	43

*TABLE IV- 28 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, & Advanced Energy Systems

PANEL SESSION: Solar Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Impact Assessments - photovoltaic power plant						X			Assessment of potential environmental effects	12
Solar Preliminary Technology Assessment						X			Assessment of environmental issues	25
SPS Environmental Analysis/Integration						X			Assessment of environmental effects	35
Environmental Development Plans for eight technologies						X			Identification of Environmental research, assessments, etc., 50%	55
NBS Standards Activities				X					Materials, safety, etc., standards for SHACOB, 15%	263
Standards & Test Procedures				X					Procedures & Standards for SHACOB Test Facilities, 2%	5
Direct Contact Liquid/Liquid, Heat Exchanger				X					Develop a liquid to liquid heat exchanger toxicologial studies, 50%	10
Marine Biota Impact Assessment for Ocean Thermal Energy Conversion(OTEC)(RFP#EG-77-R-06-1032)	X		X			X			Plan for mitigational control, 75%	75
Environmental Impact Assessments (EIA.s) of ocean test platforms for Ocean Thermal Energy Conversion (OTEC) (RFP #EG-77-R-06-1033)						X			Identification of control measures on OTEC test platforms, 50%	25
OTEC Program Management Support			X	X				X	Physical oceanographic impact control for OTEC, 50%	30
Experimental Study Flow Problems related to OTEC	X	X	X						Physical oceanographic impact control for OTEC, 25%	12
OTEC - Program Management Support			X	X				X	Marine Biota impact control for OTEC, 50%	15
OTEC Research Contracts to Review	X	X	X						Physical oceanographic impact control for OTEC, 50%	3
Environmental Impact Assessment for WECS candidate sites						X			Identify environmental issues, 50%	10
Biomass to Methane	X								Identification of products & by products requiring environmental analysis	80

TABLE IV-28 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, & Advanced Energy Systems

PANEL SESSION: Solar Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Anoerobic Digestion	X								Identification of products & by products requiring environmental analysis	50
Feedlot Energy	X			X					Idenfification of products & by products requiring environmental analysis	20
Livestock Manures and crop residues	X								Identification of products & by products requiring environmental analysis	10
Recovered Fuel Gas From Residue	X								Identification of products & by products requiring environmental analysis	10
Operation Digestion - 350 cattle unit	X			X					Identification of products & by products requiring environmental analysis	20
Pilot Feedlot			X	X					Identification of products & by products requiring environmental analysis	300
Cellulose to Sugar and Ethanol	X								Identification of products & by products requiring environmental analysis	40
Biological Production of organic solvents from cellulosic wastes	X		X						Identification of products & by products requiring environmental analysis	50
Fermentation Heat Tolerant Molds to Alcohol	X								Identification of products & by products requiring environmental analysis	34
Enzyme Hydrolysis - Acetone - Butanol & Acetic Acid	X								Identification of products & by products requiring environmental analysis	50
Control Digesters	X		X	X					Identification of products & by products requiring environmental analysis	16
Mutants of Trichoderma/Virde	X								Identification of products & by products requiring environmental analysis	40
Fermentation of Seed Weeds	X								Identification of products & by products requiring environmental analysis	18

TABLE IV-28 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, & Advanced Energy Systems

PANEL SESSION: Solar Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Bench Scale - Experimental Thermochemical Conversion	X		X	X					Identification of products & by products requiring environmental analysis	70
Operation of Wood-to-Oil pilot plant	X			X					Identification of products & by products requiring environmental analysis	120
Water/Steam Gas	X								Identification of products & by products requiring environmental analysis	50
Application of SGFM Technology to other feedstocks	X		X						Identification of products & by products requiring environmental analysis	50
Direct Combustion, collection, harvesting, & conversion of Biomass	X		X						Identification of products & by products requiring environmental analysis	150
Conversion of Biomass into Gaseous Products	X		X						Identification of products & by products requiring environmental analysis	100
Gasification	X								Identification of products & by products requiring environmental analysis	150
Catalytic Gasification	X								Identification of products & by products requiring environmental analysis	50
Georgia Tech Biomass Conversion Study	X								Identification of products & by products requiring environmental analysis	40
Systems Study of energy forming concepts based on sugarcane, sweet sorghum and sugar beets	X								Identification of products & by products requiring environmental analysis	40
Cultivation of Filamentous blue-green algae in solar bioconversion	X								Identification of products & by products requiring environmental analysis	30
Biological Investigation of kelp as a source of energy	X								Identification of products & by products requiring environmental analysis	60
Energy Production from sugar cane & tropical grasses	X								Identification of products & by products requiring environmental analysis	70

TABLE IV-28 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Solar, Geothermal, & Advanced Energy Systems

PANEL SESSION: Solar Energy

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Algae Systems Study	X								Identification of products & by products requiring environmental analysis	30
Energy Farm	X								Identification of products & by products requiring environmental analysis	80
Direct Combustion - Forest Energy Program	X								Identification of products & by products requiring environmental analysis.	50

Notes:

NBS	- National Bureau of Standards
OTEC	- Ocean Thermal Energy Conversion
SGFM	- Synthetic Gas from Feedstock Material
SHACOB	- Solar Heating & Cooling of Buildings
SPS	- Solar Power System
WECS	- Wind Energy Conversion System
RFP	- Request for Proposal

E. Environment and Safety

The environmental control related projects within the office of the Assistant Administrator for Environment and Safety (AES) were primarily located in the Division of Environmental Control Technology (ECT). They are denoted in Tables IV-29 and IV-30. The total AES FY 1977 funding associated with environmental control activities was $17,973,000 of which ECT projects comprised 93 percent, mainly in the areas supporting fossil and nuclear energy development. Fossil energy related activities comprised 33 percent and nuclear energy 45 percent of the total. The remaining 22 percent was divided into multi-technology (15 percent), solar and geothermal (5 percent), and conservation (2 percent).

In the fossil energy area, the majority of the applicable AES funding was devoted to environmental control activities related to the production of energy from coal. The remainder was primarily related to petroleum and natural gas programs with oil shale and in-situ technology development accounting for the smallest effort because of the limited RD&D efforts in that area, due to the present state-of-the-art in these energy disciplines.

Solar, geothermal, and conservation activities were a small portion of the total AES funding related to environmental control technology, primarily due to the recent emergence of these energy technologies. Principal emphasis was placed on heat transfer materials development for solar application, on waste disposal and H_2S control for geothermal energy related activities, and on urban and industrial waste control and electric power transmission environmental impacts for conservation related efforts.

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 decommissioning and decontamination efforts involved in managing surplus nuclear facilities.

The energy materials transport efforts within ECT are devoted to transportation studies including risk assessments and testing, including testing of shipping casks for radioactive wastes. Additionally, transportation statistics on attack impact, severity of accidents, and relevant environmental transport accidents were kept up to date utilizing the latest computer technology.

TABLE IV-29

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment & Safety

PANEL SESSION: Biomedical & Environmental Research

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Bioengineering Research	X								Bioprocess development for energy production & pollution abatement, 20%	40
Ecological Investigation of Uranium Mine & Mill Tailings in the Southwest U.S.								X	Evaluate revegetation trials, alternative rehabilition measures, & recommend rehabilitation protocol, 60%	60
Biophysical Chemistry	X								Photosynthesis & Biomass - solid waste utilization, 50%	297
Covalent Structure Analysis of Proteins	X								Properties of enzymes which detoxify poisons, 50%	29
IVEP Geothermal: Water Quality	X								Explore ways that geothermal resources could be used to improve water quality in Imperial Valley, 20%	101
Environmental Effects of Solid Waste as a Supplemental Fuel	X								Environmental effects of co-combustion, 50%	68
Study of Microbiological Air Quality in Relation to the Ames Municipal Solid Waste Disposal System	X	X							Analysis & suggested solutions for mitigating potential hazards, 20%	14
Assessment & Control of Radioactive Air Contaminants	X				X	X			Assess, monitor & control contaminants in public and occupational environments, 50%	42
Assessment of Environmental Conditions of the Great Lakes in Relation to Power Production		X							Evaluate control technology & resource management option for mitigating adverse impacts, 25%	35
Assessment & Control of non-nuclear Air Contaminants	X								Basic elements of control technology are evaluated for effectiveness, deficiencies are remedied by improving existing methods, or devising alternatives, 50%	58
Biomedical Treatment of Waste Streams from Conversion Processes	X								Research & development of proposed schemes for bioreactor systems, 100%	75
Terrestrial Effects of Oil Shale Development	X								Minimize environmental impact & set standards of performance for pollution control equipment, 100%	207

TABLE IV-29 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment & Safety

PANEL SESSION: Biomedical & Environmental Research

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Control Tech. Data Base							X		Information file to assist in identifying problems in environmental control, 100%	60
Applications of Holography	X								Instrumentation designed to aid the analysis & design of pollution abatement equipment for particulates and aerosols, 100%	50
Ecological Waste Water Recycling				X					Demonstration of natural ecosystem to recycle water and nutrients, 100%	60

TABLE IV-30

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment and Safety

PANEL SESSION: Environment Control Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Environmental Control Technology for Generation of Power from Coal (ANL)		x				x			Comparative assessments of coal/control technologies, 100%	1,035
Environmental Control Technology Survey of U.S. Stripmining Sites (ANL)		x			x	x			Evaluate control technologies for new and expanding mines, 100%	270
Assessment of Once-Through Cooling Water Control Technology (ANL)		x				x			Cooling water controls, 100%	55
Preliminary Overview of Environment Control Technology for CO_2 Emissions (BNL)		x				x			Emission control option, 100%	10
Evaluation of Pollutants from Flash-Hydro Gasifier (BNL)		x							Evaluate pollutants for control requirements, 100%	25
Environmental Control Technology Aspects of In-Situ Gasification (LLL)		x			x	x			Identify control requirements, 100%	339
Assessment of Environmental Control Technology for Coal Conversion Wastewater Systems (ORNL)	x					x			Determine adequacy of existing control methods and identification of new control techniques, 100%	200
Control of Hydrocarbon and CO Emissions Associated with First Generation Gasifiers (ORNL)					x	x			Emission control, 100%	35
Assessment of Environmental Control Technology for First Generation Coal Gasifiers, Excluding Lurgi (PNL)						x			Provide economic basis for evaluation control methods for commercial coal gasification systems, 100%	29
Assessment of Environmental Control Technology for Waste Systems in In-Situ Coal Gasification (LERC)		x			x	x			Evaluate waste systems control, 100%	208
Assessment of Radiological Impact of Western Coal Utilization (MOUND)	x					x			Control of radiological emissions, 100%	58
Inventory of Environmental Control Technology Activities (Aerospace Corporation)								x	Define and catalog all the ERDA projects related to environmental control technology, 100%	120

TABLE IV-30 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment and Safety

PANEL SESSION: Environment Control Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Interim Planning and Test Support on the Homer-City Coal Gasification Plant (EPA)		x			x	x			Evaluate control requirements and performance, 100%	200
Noise: Its Biomedical and Environmental Considerations in Coal Processes (Bolt, Berenek, and Newman)		x			x	x			Assess noise control options, 100%	20
Evaluation of Lurgi Gasifier, Two-Stage Quench for Water Pollution (Arthur G. McKee)		x				x			Water pollution control studies, 100%	25
Assessment of Environmental Control Technology Options for Waste Heat and Water Quality (MIT)	x	x				x			Evaluate options for waste heat and water quality, 100%	304
Environmental Control Needs for Entrained Gasifier (Eyring Institute, BYU)	x	x				x			Evaluate control requirements for entrained gasifier, 100%	88
Treatment of Synthane Gasification Wastewaters (PERC)		x				x			Assess wastewater controls and treatment, 100%	55
Assessment of Environmental Control Technology for Lurgi Gasifiers (U. of North Dakota)	x	x				x			Provide new term assessment of Lurgi process, 100%	30
Evaluation Control Assessment of Coal Preparation Plants (BCR)		x				x			Assess coal preparation techniques and controls, 100%	375
Environmental Control Technology Aspects of Coal Slurry Transportation (UCLA)	x	x							Studies on environmental impacts of coal slurries, 100%	70
Trace Element Characterization Removal/Recovery (LASL)	x	x			x				Identify trace elements and control requirements, 100%	325 (EPA pass thru funding)
Identification of Refractory Organic Compounds in Treated Refinery Wastes (ANL)				x		x			Evaluation of the effectiveness of activated sludge and activated carbon waste water treatment, 100%	77
Integrated LNG Safety and Control Program (PNL)		x				x			Identify environmental impacts, 100%	420
LNG-Wind Tunnel and Instrumentation Assessments (R & D Associates)						x			Assess environmental impacts and site criteria, 100%	120

TABLE IV-30 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment and Safety

PANEL SESSION: Environment Control Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
LNG-Analysis of LNG Storage and Transportation Characteristics (IGT)		x							Evaluate environmental control needs, 100%	15
LNG-Scale Effects in LNG Hazards Analysis and Testing (MIT)		x							Impact of scaling on LNG site selection, 100%	69
Oil-Oil and Hazardous Materials Simulated Environmental Test (EPA)		x			x				Field test of oil spill cleanup equipment, 100%	75
Oil Spill Training School (Texas A & I University)							x		Develop curriculum for oil spill training, 100%	120
Assessment of Practicability of Oil Spill Treatment (University of Rhode Island)		x				x			Assess advantages/disadvantages of treating oil spills, 100%	400
Assessment of Hazards and Control of LNG Spills on Water (USCG)	x					x			Identify environmental impacts, 100%	100
Medium Scale LNG Tests (NWC, China Lake)	x				x				Identify environmental impacts, 100%	50
Assessment of Hydrocarbon Sensors (MIT)		x				x			Assess feasibility of three types of sensors to detect methane, 100%	48
Off-Shore Cleanup Assessment (EPA)					x	x			Field test of oil spill cleanup equipment, 100%	330
Boiling of LPG on Water (MIT)	x				x	x			Safety of the transportation of hydrocarbon fuels, 100%	46
Assessment of Control Implications for Enhanced Oil Recovery Wastewaters (University of Tulsa)	x					x			Assess wastewater treatment techniques, 100%	32
Site Criteria for Large Scale LNG Tests (LLL)		x							Identify test site characteristics, 100%	35
Design for Medium Scale LNG Tests (Holmes and Narver)		x	x						Determine preliminary requirements for medium scale test site, 100%	97

TABLE IV- 30 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment and Safety

PANEL SESSION: Environment Control Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 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 Wastewaters in In-Situ Oil Shale Retorting (PNL)	x	x				x			Wastewater control and management, 100%	100
Environmental Control Implications of Tar Sands Development (University of Utah)		x				x			Determine environment control implications, 100%	57
Development of Control Strategy for In-Situ Oil Shale (Denver Research Institute)		x				x			Determine environmental control implications, 100%	20
Environmental and Fire Hazards of Materials used for Solar Heating and Cooling (SANDIA)		x				x			Evaluate environmental impacts of heat transfer materials, 100%	115
Environmental Impacts of Energy Production using Solar Derived Fuels (Ames Lab)		x			x	x			Determine environment impact, 100%	25
GLGP Applications Environment and Safety Assessment (LLL)						x			Assess environmental and safety issues, 100%	34
IVEP: Control Technology Assessment (LLL)		x				x			Geothermal energy control assessment, 100%	46
Research Program Plan for Geothermal Liquid Waste Disposal (PNL)		x				x			Waste disposal, 100%	150
Evaluation of H_2S Control Technology for Geothermal Energy (MRI)		x				x			Pollution control evaluation, 100%	26
Assessment of Environmental Control for High Magnetic Fields (LASL)						x			Control assessment, 100%	50
Compressed Air Energy Storage--Environmental Concerns (PNL)		x				x			Environmental control implications, 100%	19
Energy Conserving Industrial Waste Treatment Process (PNL)		x				x			Determine control requirements, 100%	22

TABLE IV- 30 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment and Safety

PANEL SESSION: Environment Control Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Assessment of Waste Utilization Control Technology (Ames Lab)		x			x	x			Assess Urban waste management and impact on electric power generation, 100%	88
Feasibility Study of Transformer Noise Reduction System (Westinghouse)		x							Noise control, 100%	22
Environmental Control Technology Requirements for Future A.C., High-Voltage, Overhead Transmission (SRI)		x				x			Determine environmental control requirements, 100%	33
Analysis of Nuclear Fuel Cycles (PNL)		x				x			Adequacy of environmental controls considerations and control improvements, 100%	700
Evaluation of Ocean Bed Disposal--High Level Waste (HLW) (SANDIA)	x	x				x			Investigate methods for emplacement of HLW in submarine geologic formation of deep oceans, 100%	:,000
Critical Review and Assessment of Hydrogen Economy Transport (LASL)		x				x			Assess control technology for hydrogen, 100%	115
Energy Materials Transport (PNL)		x				x			Identify potential problems, establish needs and objectives, and examine future transportation systems, 100%	285
Assessment and Application of Endochronic Plasticity for Transportation (ANL)		x				x			Assess control options, 100%	20
Development of Computer Analysis Methods (LASL)		x		x		x			Assess package designs, 100%	160
Review Criteria for Nuclear Criticality Safety Evaluation for Fission Material Transport (ORNL)		x							Evaluate radioactive material safety, 100%	25
Testing of Large Obsolete Casks (ORNL)				x	x				Destruction tests to yield information on damage to casks and to contents, 100%	150

TABLE IV- 30 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment and Safety

PANEL SESSION: Environment Control Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Transportation Safety Studies (PNL)		x		x	x	x			Develop methodology and perform risk assessments, 100%	240
Package Failure from Malevolent Attack (SANDIA)		x			x	x			Determine attack impact and improvement measures, 100%	60
Study of Physical Parameters of Transportation Accidents (SANDIA)		x							Qualify severity of accidents, 100%	85
Full-Scale Vehicle Testing Program (SANDIA)	x			x	x	x			Assess validity of analyses and scale model testing, 100%	830
Structural Response of Shipping Containers Under Accident Conditions (BATTELLE)		x		x					Determine structural integrity and dynamic material properties of waste containers, 100%	100
Transportation Statistics Data Bank (ORNL)		x							Maintain data bank on ERDA statistics, 100%	50
Maintenance of Transportation Accident Environmental Data Bank (SANDIA)		x							Storage of relevant environmental accident data, 100%	60
Films-Transport and Packaging of Radioactive Waste (SANDIA)							x		Production of films on packaging and shipping of radioactive waste, 100%	50
Exhibit (Operating)-Transporting Radioactive Cargoes (Oak Ridge Associated Universities)							x		Increase public awareness of environmental control requirements, 100%	45
Transport Exhibit Operations (NORCUS)							x		Increase public awareness of environmental control requirements, 100%	34
Transport Consultant								x	Independent law analyses, 100%	21
Surplus Facility Surveillance (ANL)					x				Monitor radiation hazards, 100%	20
Salvage of Alpha Contaminated Metals (ANL)	x	x							To provide and evaluate techniques for decontamination of metals, 100%	75

TABLE IV-30 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment and Safety

PANEL SESSION: Environment Control Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Surplus Facility Surveillance (ORNL)					x				Monitor radiation hazards, 100%	105
FPDL Facility Surveillance (ORNL)					x				Monitor radiation hazards, 100%	160
Planning for Disposition of Excess Reactor Facilities (ORNL)		x							Study alternatives for making reactors indefinitely, environmentally safe, 100%	70
Disposition of Hanford Retired Facility (PNL)		x		x	x	x			Planning for Hanford D&D (80%) and development of D&D techniques (20%)	640
Geologic, Geophysical, and Biologic Characterization of Solid Waste Burial Grounds (PNL)	x				x	x			Define the hazards of buried radionucleides to the environment, 100%	228
Hallam and Piqua Surveillance (BATTELLE)					x				Radiation monitoring, 100%	2
Surveillance-INEL Shutdown Reactors (Aerojet Nuclear)					x				Radiation monitoring, 100%	60
Surplus Facility Surveillance (Atlantic Richfield)					x				Radiation monitoring, 100%	350
Contaminated Equipment Volume Reduction (Atlantic Richfield)	x		x	x					Reduction of volume of contaminated equipment to a size and form suitable for terminal storage of disposal, 100%	310
D & D of SNAP Facility (Atomics International)					x	x		x	Removal of a potential environmental hazard, 100%	130
D & D of SRE Facility (Atomics International)		x			x	x		x	Removal of a potential environmental hazard, 100%	2,600
Surplus Facility Surveillance-HWCTR Stand-by (Du Pont)					x				Radiation monitoring, 100%	5
Disposal of Contaminated Metal (NLO)			x	x		x			Design and construct a portable ferrous smelter for recycling contaminated scrap, 100%	200
D & D of PRNC Reactor Facility (PRNC)		x							Prepare decontamination plan for CEER reactor facility; Mayaquez, Puerto Rico, 100%	50
Project GNOME Site Disposal (REECO)					x	x		x	Removal of a potential environmental hazard, 100%	100

TABLE IV-30 (Cont)

PROJECTS WITH ENVIRONMENTAL CONTROL ASPECTS

ENERGY TECHNOLOGY: Environment and Safety

PANEL SESSION: Environmental Control Technology

Project/Element Title	Check Primary Category of Environmental Control Aspects								Portion of the Project or Element Related to Environmental Control Technology	FY 1977 Funding Allocation Related to Environmental Control Technology ($ in thousands)
	Research	Studies	Design	Development	Sampling and Analysis	Assessment	Instructional	General		
Weldon Spring Site Decommissioning (NLO)		x			x			x	Removal of a potential environmental hazard, 100%	25
Decontamination of Niagara Falls Site (NLO)		x			x			x	Removal of a potential environmental hazard, 100%	10
Surplus Facility Surveillance (REECO)					x				Radiation Monitoring, 100%	15
NRDS Fuel Packaging Site Surveillance and Disposition (REECO)					x			x	Clean up and removal of radioactive wastes, 100%	1,130
Surplus Facility Surveillance (United Nuclear)					x				Radiation Monitoring, 100%	70

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VI. Glossary

A.C.	Alternating Current
AC	Assistant Administrator for Conservation
AES	Assistant Administrator for Environment and Safety
AFE	Assistant Administrator for Fossil Energy
ANE	Assistant Administrator for Nuclear Energy
ANFLOW	Anaerobic Digester Using Fluidized Bed Combustion
ANL	Argonne National Laboratory
ANS	Assistant Administrator for National Security
ASEV	Assistant Administrator for Environment
ASGA	Assistant Administrator for Solar, Geothermal, and Advanced Energy Systems
BER	Division of Biomedical and Environmental Research
BCR	Bituminous Coal Research, Incorporated
BCS	Division of Buildings and Community Systems
BNL	Brookhaven National Laboratory
B/O	Budget Outlays
BTU	British Thermal Unit
BYU	Brigham Young University
CEER	Center for Energy and Environment Research
CONRT	Division of Conservation Research and Technology
D.C.	Direct Current
D&D	Decontamination and Decommissioning
DOE	Department of Energy
ECT	Division of Environmental Control Technology
EHV	Extra High Voltage
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EQ	Equipment
ERDA	Energy Research and Development Administration
FFTF	Fast Flux Test Facility
FPDL	Fission Power Development Laboratory
FY	Fiscal Year
GE	Division of Geothermal Energy
GC	Gulf Coast
GLGP	Geothermal Loan Guarantee Program
HFBR	High Flux Beam Reactor
HLW	High Level Waste
HVDC	High Voltage Direct Current
HWCTR	Heavy Water Components Test Reactor

IGT	Institute of Gas Technology
ILW	Intermediate Level Waste
INEL	Idaho National Engineering Laboratory
INDUS	Division of Industrial Energy Conservation
IVEP	Imperial Valley Environmental Project
LASL	Los Alamos Scientific (National) Laboratory
LBL	Lawrence Berkeley (National) Laboratory
LERC	Laramie Energy Research Center
LLL	Lawrence Livermore (National) Laboratory
LMFBR	Liquid Metal Fast Breeder Reactor
LNG	Liquified Natural Gas
LPG	Liquified Petroleum Gas
LWR	Light Water Reactor
MFE	Division of Magnetic Fusion Energy
MIT	Massachusetts Institute of Technology
NBS	National Bureau of Standards
NCRR	National Center for Resource Reserve
NEC	Nuclear Energy Center
NEPA	National Environmental Policy Act
NLO	National Lead Company of Ohio
NOAA	National Oceanic and Atmospheric Administration
NR	Division of Naval Reactors
NRA	Division of Nuclear Research and Applications
NRC	Nuclear Regulatory Commission
NRDS	Nuclear Rocket Development Station
NWC	Naval Weapons Center, China Lake
NWTS	National Waste Terminal Storage Program
OC	Office of the Controller
OP	Operating Expenses
ORNL	Oak Ridge National Laboratory
OTEC	Ocean Thermal Energy Conversion
PACE	Plant and Capital Equipment
PAD	Program Approval Document
PCB	Polychlorinated Biphenyls
PEP	Positron-Electron Project
PERC	Pittsburgh Energy Research Center
PNL	Pacific Northwest Laboratory
PRNC	Puerto Rico Nuclear Center
R	Division of Physical Research
REECO	Reynolds Electric and Engineering Company
RDD	Division of Reactor Development and Demonstration
R&D	Research and Development
RD&D	Research, Development and Demonstration
RFP	Request for Proposal
RPIS	Research Project Identification System

SGFM	Synthetic Gas from Feedstock Material
SHABOC	Solar Heating and Cooling of Buildings
SLAC	Stanford Linear Accelerator Center
SNAP	Space Nuclear Auxiliary Power
SOLAR	Division of Solar Energy
SPS	Solar Power System
SRC	Solvent Refined Coal
SRE	Sodium Reactor Experiment
SRI	Stanford Research Institute
STOR	Division of Energy Storage Systems
TEC	Division of Transportation Energy Conservation
TRU	Transuranic Waste
UCLA	University of California at Los Angeles
URE	Division of Uranium Resources and Enrichment
USCG	United States Coast Guard
VHTR	Very High Temperature Gas Cooled Reactor
WECS	Wind Energy Conversion System
WPR	Division of Waste Management, Production and Reprocessing