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Office of Environment Statement of Programs: FY 1979

July 1978

✓
U.S. Department of Energy

Assistant Secretary for Environment

✓ Office of Planning Coordination

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U.S. Department of Energy

Assistant Secretary for Environment

Office of Planning Coordination

Washington, D.C. 20545

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Preface

Meeting our energy needs and protecting the quality of our environment are complementary parts of our national energy planning. The search for energy supplies and the development of new energy sources must go hand-in-hand with clean air, clean water, and a healthy environment.

The Office of Environment (EV) has a major responsibility in the Department of Energy (DOE) for assuring that environmental concerns are translated into environmental programs and commitments. EV studies the environmental, health and safety (EH & S) effects of all DOE energy programs, overviews the environmental aspects of these programs, and ensures their consistency with environmental and safety laws, regulations, and policies. EV programs support the Department's efforts to achieve the best balance be-

tween energy availability and environmental acceptability.

This document briefly describes EV activities, summarizes programs for FY 1979, and identifies responsible divisions and offices. Included are funding levels and budgetary trends for EV programs and the energy technologies they support, as well as institutions responsible for performing the EV activities.

Energy/Environment choices are complex and have implications for future generations. Attention to EH&S performance is an integral part of individual energy program performance in DOE. EV's policy role and interaction with all programs in the decision-making process assures a high priority for environmental concerns within and across the Department's energy programs.

Lone rider sits atop a reclaimed coal mine pit in Wyoming.

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Abbreviations

AEAR	Annual Environmental Analysis Report
AEC	Atomic Energy Commission
ASEV	Assistant Secretary for Environment
BER	Division of Biomedical and Environmental Research
CEQ	Council on Environmental Quality
DEI	Division of Environmental Impacts
DOE	Department of Energy
DPA	Division of Policy Analysis
DRA	Division of Regional Assessments
DTO	Division of Technology Overview
ECT	Division of Environmental Control Technology
EH&S	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
ERC	Energy Research Center
ERDA	Energy Research and Development Administration
EV	Office of Environment
FEA	Federal Energy Administration
FERC	Federal Energy Regulatory Commission
GOCO	Government-Owned, Contractor-Operated
LOFT	Loss-of-Fluid Test
MOPPS	Market-Oriented Program Planning Study
NEPA	National Environmental Policy Act
NRC	Nuclear Regulatory Commission
NSC	Office of Nuclear Safety Coordination
O&A	Overview and Assessment
OES	Division of Operational and Environmental Safety
OMB	Office of Management and Budget
ONA	Office of NEPA Affairs
OTI	Office of Technology Impacts

Executive Summary

One of the missions of the Department of Energy (DOE) is to integrate short-range energy policy and regulatory activities with longer range energy technology research and development. The DOE Act of 1977 (PL 95-91) specifically state the DOE responsibility to assure environmental quality, public health and safety, and conservation as part of national energy policy. The Office of Environment (EV), under the Assistant Secretary for Environment (ASEV), supports the DOE mission of energy sufficiency with minimal environmental disruption. The relative position of EV within DOE is shown in Appendix A. The functions of the Office of Environment are: overview; research; and environmental, health and safety (EH&S) assurance. These functions are discussed below.

Functional Responsibilities of EV

EV major responsibilities in support of DOE's mission include:

- Overview of environmental* activities in DOE, with an emphasis on assuring implementation of the National Environmental Policy Act (NEPA), including providing energy/environmental policy guidance to all DOE offices and field organizations;
- Research on EH&S effects, with increased emphasis on non-nuclear energy technologies, including conservation; and
- EH&S assurance, including minimizing risks to employees and the public, protection of property and the environment within and outside DOE facilities, provision of operational EH&S assistance, policies, guidelines, and support to DOE facilities.

Exhibit 1 illustrates EV functions and external relationships. EV responsibilities are carried out by the various Divisions and Offices, assisted by DOE multi-program laboratories, EV program-dedicated (specialized) laboratories, energy research centers, universities, and other contractors.

EV Programs

EV programs are as follows:

- Environmental R&D;
 - Overview and Assessment
 - Biomedical and Environmental Research
- Life Sciences Research and Biomedical Applications;
- Decontamination and Decommissioning; and
- Light Water Reactor Facilities.

EXHIBIT 1

EV FUNCTIONS AND EXTERNAL RELATIONSHIPS

*The terms "environment" and "environmental" are used broadly to refer to the following concerns: public and occupational health and safety, socioeconomic, institutional, ecological, cultural, and aesthetic. For conciseness, these factors are referred to as environmental, health and safety (EH&S) factors.

EXHIBIT 2

EV PROGRAM AREAS AND ORGANIZATIONAL ELEMENTS

Exhibit 2 illustrates the program areas and their relationships to EV Divisions and Offices.

The *Overview and Assessment* program area is designed to ensure that DOE places adequate emphasis on EH&S considerations in formulating and implementing national energy policies and energy research, development, and demonstration (RD&D) plans and activities. This objective is achieved through such activities as: identifying EH&S issues and requirements for planning of EH&S research and assessment activities; developing adequate environmental performance criteria; evaluating the status of environmental control capability and identifying control gaps which may need additional attention; ensuring safe operations; developing data bases; and ensuring DOE compliance with all requirements of NEPA.

Biomedical and Environmental Research is the principal program area for research related to protecting the environment from the effects of the development and use of energy resources.* Programs in this category** are designed to identify the adverse EH&S effects of energy technologies; to develop methods for mitigating or eliminating these effects; and to

develop a factual base for informed public judgments on the environmental consequences associated with energy technologies. These programs, managed by the Division of Biomedical and Environmental Research, are conducted primarily by the DOE multi-program laboratories, specialized EV laboratories, and contracts with universities and research institutions.

Research conducted within the *Life Sciences Research and Biomedical Applications* program area, also mandated by PL 95-91, indirectly supports the development of energy technologies. General life sciences research provides the conceptual basis for understanding the interference of physical and chemical agents with life processes in ecological systems and populations, including humans. More fundamental research on biological energy conversions is also supported. Research on Biomedical Applications facilitates transfer of nuclear technology to medicine to develop advanced diagnostic and therapeutic methods. The Division of Biomedical and Environmental Research manages the programs in this category.

The *Decontamination and Decommissioning* program area provides for the safe management, rehabilitation, and disposition of all radioactively contaminated DOE facilities, as well as for reducing the potential environmental hazards at certain privately owned sites. This program includes activities such as maintaining surveillance of contaminated DOE sites, developing improved disposition methods, and planning and conducting projects to minimize risk and restore sites and facilities for beneficial uses. These programs are managed by the Division of Environmental Control Technology.

The *Light Water Reactor Facilities* program area provides DOE facilities for the conduct of Nuclear Regulatory Commission (NRC) reactor safety experimental research. The major objective in FY 1979 is to complete the Loss-of-Fluid Test (LOFT) Facility and to obtain NRC acceptance of the facility for the conduct of NRC's experimental program. The NRC experimental program in LOFT will provide information on a postulated loss-of-coolant accident in a commercial, pressurized-water, nuclear system. The Office of Nuclear Safety Coordination is responsible for this program area and for coordinating all NRC work carried out on a cost-reimbursable basis in DOE laboratories.

Funding Trends: 1975-1979

The FY 1979 operating budget request for EV programs is about \$260 million (budget outlays).*

*The mandate for this research was stated in the Atomic Energy Act (42 USC 2011) and the Energy Reorganization Act of 1974 (PL 94-438) and is currently stated in the DOE Organization Act of 1977 (PL 95-91).

**These programs include: Human Health Studies, Health Effects Research in Biological Systems, Environmental Studies, and Physical and Technological Studies.

*In this document, budget data are provided in terms of outlays as reflected in the President's budget submitted to the Congress.

Exhibit 3 shows the allocation of FY 1979 funds among the program areas. From 1975 to 1979, overall funding for EH&S programs has increased gradually, as shown in Exhibit 4. Within the program areas, Overview and Assessment and Decontamination and Decommissioning have shown the most rapid growth. Increased funding for Overview and Assessment pro-

grams has facilitated assessment of the EH&S effects of an increasing number of energy development and conservation options. Increased funding for Decontamination and Decommissioning has addressed Congressional concern for returning contaminated facilities and sites to productive uses.

EXHIBIT 3
EV FUNDING ALLOCATIONS: FY 1979
(IN \$ M OPERATING FUNDS)

(Outlays in \$ Million)					
	FY 1975	FY 1976	FY 1977	FY 1978	FY 1979*
• OPERATING FUNDS					
Environmental R&D					
— Overview and Assessment	9.4	18.5	32.3	42.4	47.7
— Biomedical and Environmental Research	96.6	106.3	121.8	135.3	133.8
Life Sciences Research and Biomedical Applications	29.1	36.9	41.3	40.1	39.2
Decontamination and Decommissioning	6.7	7.3	7.8	16.2	23.5
Light Water Reactor Facilities	—	—	19.5	23.6	13.6
Total Operating Funds	141.8	169.0	222.7	257.6	257.8
• EQUIPMENT FUNDS	9.1	11.2	12.0	19.8	13.5
• CONSTRUCTION FUNDS	20.3	14.5	10.5	13.0	10.5
TOTAL EV FUNDING	171.2	194.7	245.2	290.4	281.8

*President's Budget to Congress

EXHIBIT 4
EV FUNDING TRENDS: FY 1975-1979

Exhibit 5 shows the funding trends by technology between FY 1975 and FY 1979 for Environmental R&D.* Funding for fossil-technology environmental research has increased the most over this period, consistent with the Department's priorities.

Although the overall DOE budget for fossil environmental research will increase in FY 1979, the EV portion of this budget will decrease because certain projects will be transferred to the Environmental Protection Agency (EPA). These projects will support EPA development of regulatory standards and long-range environmental goals related to fossil fuels.

Exhibit 6 presents the FY 1979 funding by type of performing institution.

*Environmental R&D includes Overview and Assessment, and Biomedical and Environmental Research programs.

*Solar, Geothermal, Fusion and Conservation

**More than one of the following: Fossil, Solar, Geothermal, Fusion, Conservation and Nuclear

EXHIBIT 5 ALLOCATION OF ENVIRONMENTAL R&D FUNDS TO TECHNOLOGY SUPPORT

EXHIBIT 6 ALLOCATION OF EV OPERATING FUNDS (\$M) TO PERFORMING INSTITUTIONS: FY 1979

Introduction

The evolution of the national energy establishment reflects the national commitment to balanced research, development, demonstration, and commercialization of energy technologies. Federal energy responsibilities, formerly distributed among several agencies, are now consolidated in the Department of Energy (DOE).

In the transition from the Energy Research and Development Administration (ERDA) to DOE, increased emphasis has been placed on transferring energy technologies from research and development to commercial use. The DOE organizational structure facilitates the movement of technologies to more advanced stages of development or commercialization as quickly as technical, economic, and environmental feasibility allows. The expanded functions of the Office of Environment (EV), DOE's lead organization for environmental, health and safety (EH&S) matters, have evolved in response to DOE's broadened mission and the need to consider the EH&S issues associated with all energy programs.

The DOE Organization Act of 1977 (PL 95-91) reiterated ERDA's principal goals, but also emphasized conservation, and development of inexhaustible technologies, such as solar and geothermal energy. One of the major purposes of the Act is:

"To assure incorporation of national environmental protection goals in the formulation and implementation of energy programs and to advance the goals of restoring, protecting, and enhancing environmental quality and assuring public health and safety." (Sec. 102(13))

Current EV responsibilities are highlighted in Exhibit 7.

Each stage of an energy technology or fuel cycle can pose problems related to various areas of environmental impact, including:

- Air Quality,
- Water Quality,
- Climate,
- Land,
- Ecology,
- Health,
- Safety, and
- Socioeconomic Structures.

These problems must be analyzed in terms of their ecological disturbances, social and economic effects,

and public and occupational health and safety considerations; and appropriate solutions must be formulated. Activities within EV address the EH&S impacts of each DOE energy program and of national energy and environmental policies. EV ensures that its environmental research program is responsive to DOE energy technology program needs by:

- Identifying potential EH&S issues of energy policies and technologies;
- Comparing ongoing research against identified needs;
- Guiding the laboratories, other field organizations, and universities with respect to definition of research requirements; and
- Selecting and funding high-quality and high-priority research proposals which best support research needs and program objectives.

EV places a high priority on avoiding duplication of effort by coordinating with energy program offices and other Federal agencies. Informal agreements, memoranda of understanding, and formal task forces define the scope and substance of coordinated activities with other Federal agencies. Primary Federal agencies participating in energy/environmental coordination efforts include:

- The Environmental Protection Agency,
- The Nuclear Regulatory Commission,

- The Department of Interior,
- The Department of Labor,
- The Department of Health, Education and Welfare,
- The Department of Commerce,
- The Department of Defense,
- The Department of Agriculture,
- The Department of Transportation,
- The Department of Housing and Urban Development,

- The National Aeronautics and Space Administration,
- The National Science Foundation, and
- The Tennessee Valley Authority.

An important tool in the coordination with other agencies is an annual inventory of Federal energy-related environmental and safety research, which documents research projects performed by DOE and other Federal agencies.

NEPA Guidance and Compliance*	Policy Guidance Environmental Laws & Procedures	Health & Safety Issues	Management of Environmental R&D Programs
<ul style="list-style-type: none"> • Provide NEPA technical assistance and policy guidance to DOE program and regulatory offices (except FERC) • Independently review, exercise quality control over, and approve NEPA documents • Prepare policy and legislative EIS's for broad departmental actions • Develop DOE NEPA policies and internal directives • Review and prepare comments on EIS's from other agencies 	<ul style="list-style-type: none"> • Review and assess environmental, analytical, and technical products prepared by other DOE program offices • Review and assess DOE policies and strategies for environmental implications • Establish technology priorities for EV use in developing research priorities • Act as link to environmental agencies and the environmental community 	<ul style="list-style-type: none"> • Ensure adequacy and effectiveness of DOE environmental, health and safety activities • Conduct independent audits, assessments, and appraisals • Ensure development of uniform environmental, health and safety requirements, standards, and guidelines 	<ul style="list-style-type: none"> • Conduct environmental, health and safety R&D • Ensure implementation of practical, substantive environmental mitigating measures in DOE programs

* All EV Offices assist the Office of NEPA Affairs in developing and reviewing NEPA documents.

EXHIBIT 7

RESPONSIBILITIES AND FUNCTIONS OF THE OFFICE OF THE ASSISTANT SECRETARY FOR ENVIRONMENT

Organizational Responsibilities

The organization of EV programs reflects the functional responsibilities of ASEV as well as the budgetary concerns of Congress and the Office of Management and Budget. The following sections describe EV organizational responsibilities for FY 1979 programs. The present organization of EV, by offices and divisions, is shown in Exhibit 8. A listing of the names of principals is included in Appendix B.

Office of NEPA Affairs (ONA)

The Office of NEPA Affairs (ONA) deals with the variety and complexity of DOE programs and assures agency-wide implementation and compliance with the National Environmental Policy Act (NEPA) and related guidelines published by the Council on Environmental Quality (CEQ). ONA encompasses the Environmental Impacts Division of the former Federal

Energy Administration (FEA) and the Office of NEPA Coordination in the former Energy Research and Development Administration (ERDA).

ONA activities include:

- Participating in the early planning of policy, regulatory and legislative issues to assure NEPA compliance;
- Formulating NEPA policy guidance for the Secretary and all elements of DOE;

EXHIBIT 8

EV ORGANIZATION

- Providing a focal point for coordination of NEPA matters with other agencies;
- Guiding and coordinating the preparation and review of Environmental Assessments and Impact Statements;
- Providing independent review and approval of DOE NEPA documents; and
- Identifying and coordinating NEPA matters in the preparation of Environmental Development Plans (EDP's).

ONA responsibilities are carried out by the Divisions of NEPA Policy Planning and NEPA Program Review and Coordination.

Office of Technology Impacts (OTI)

This office is the focal point for analyzing the impacts of environmental policies, laws, and regulations of significant interest to DOE. OTI was created to combine the environmental review and analysis functions of ERDA with the FEA Office of Energy Policy. OTI performs the following functions:

- Supporting DOE environmental policy development by providing information on energy-related environmental impacts;
- Analyzing EH&S impacts of DOE policies;
- Analyzing regional and national EH&S impacts of DOE energy options;
- Analyzing environmental regulations as they affect DOE programs; and
- Preparing Environmental Development Plans (EDP's) in collaboration with DOE energy and technology offices and divisions. The EDP's highlight EH&S concerns associated with energy technologies.

OTI responsibilities are carried out by the Divisions of Policy Analysis, Technology Assessment, Environmental Impacts, and Regional Assessments.

Division of Environmental Control Technology (ECT)

This Division supports the ASEV in fulfilling two primary responsibilities:

- The independent overview and assessment of environmental control aspects of DOE's research, development, and demonstration

(RD&D) programs and of the nation's energy policies; and

- The safe management and disposition of selected radioactively contaminated sites.

ECT carries out its responsibilities by:

- Evaluating the adequacy of environmental controls and identifying potential control alternatives or required RD&D; and
- Managing activities for the decontamination and decommissioning of surplus DOE-owned facilities and for remedial actions at sites formerly used in the nuclear program.

Division of Operational and Environmental Safety (OES)

OES ensures that all DOE-controlled activities are conducted in a manner that will reduce risks to the health and safety of the public and employees to acceptably low levels, and will provide adequate protection of property and the environment. OES advises and supports the DOE technology program offices, field

Technicians prepare to collect atmospheric data for air pollution studies.

organizations, and contractors, which develop and conduct the EH&S activities. OES activities include:

- Interpreting operational and environmental policy and standards;
- Developing and establishing operational and environmental safety guidelines;
- Conducting independent audits and appraisals; and
- Recommending corrective actions for identified EH&S problems.

Division of Biomedical and Environmental Research (BER)

BER manages a research program to determine the potential adverse EH&S effects of energy technologies.* Basic and applied science research is conducted to gain a greater understanding of fundamental physical, chemical, and biological systems.

BER research is carried out by:

- Multi-program and other DOE laboratories,
- Universities,
- Non-profit organizations, and
- Other contractors.

BER provides information and technical consultation to EV to determine the adequacy of EH&S activities related to developing energy technologies. This information also supports the efforts of the technology program offices in ensuring EH&S acceptability of their activities during energy development, demonstration, and commercialization.

Office of Carbon Dioxide Effects Research and Assessment

Programs under the Office of Carbon Dioxide Effects Research and Assessment will be budgeted under BER in FY 1979. The role of this Office is to develop the capability to predict the economic, environmental, social, and political costs of increasing concentrations of carbon dioxide. The results of this research will support policy decisions on the future global use of fossil fuels.

*The statutory basis for current activities performed in BER was provided by the Atomic Energy Act (42 USC 2011) and the Energy Reorganization Act of 1974 (PL 94-438) and is currently stated in the DOE Organization Act of 1977 (PL 95-91).

Office of Nuclear Safety Coordination

The major activities of this Office include:

- Coordinating the NRC programs conducted in DOE laboratories and facilities;
- Completing the LOFT facility at the Idaho Nuclear Engineering Laboratory for the conduct of NRC's experimental program; and
- Directing and coordinating programmatic safety reviews of selected nuclear research and test reactor facilities.

Office of Planning, Program, and Management Coordination

This office provides a focal point for the functions that cut across the EV structure. These functions include:

- Budget (and contract) coordination,
- Planning coordination,
- Administrative services, and
- Institutional relations.

The Offices of Planning Coordination, Program Coordination, and Management Coordination and the Staff for Institutional Relations are the focal points for these activities.

Field Organizations

The major portion of EV work is conducted through the DOE multiprogram and EV special or program-dedicated laboratories. These and the Energy Research Centers (ERC's) represent the major types of performing institutions. Exhibit 9 shows the relationship between DOE program offices and DOE field research and development facilities. Other public and private sector organizations are also used to obtain the best available technical and analytical expertise. Examples of energy-related environmental activities performed by DOE field organizations are summarized in Appendix C.

Electron photomicrograph of an ash particle found on a hickory leaf.

EXHIBIT 9

MAJOR DOE FIELD ORGANIZATIONS CONDUCTING EV PROGRAMS (As of May 1, 1978)

Program Areas

EV activities are grouped as follows:

- Environmental R&D
 - Overview and Assessment
 - Biomedical and Environmental Research
- Life Sciences Research and Biomedical Applications
- Decontamination and Decommissioning
- Light Water Reactor Facilities

EV programs correspond to offices and divisions, except for Overview and Assessment, which crosses organizational lines.

Overview and Assessment

OVERVIEW AND ASSESSMENT PROGRAMS

- Environmental Policy Analysis
- Integrated Assessment
- Environmental Engineering
- Operational and Environmental Safety
- Overview Management

The programs budgeted under Overview and Assessment (O&A), unlike other EV programs, are administered by several EV divisions and offices.* These programs are concerned with:

- Incorporating EH&S factors in national energy policy implementation;
- Assuring the existence of adequate environmental performance criteria and control technologies;

*These include: Division of Environmental Control Technology; Office of Technology Impacts; Division of Operational and Environmental Safety; Office of NEPA Affairs; and Office of Planning, Program, and Management Coordination (see Exhibit 2).

- Establishing EH&S standards or guidelines for DOE facilities;
- Developing environmental data bases; and
- Assuring DOE compliance with all requirements of NEPA.

Environmental factors are considered during the development of DOE legislation, the formulation of economic, regulatory, and program issues, as well as at each stage of energy RD&D.

Exhibit 10 illustrates the allocation of the requested FY 1979 budget* and five-year funding trends.** Exhibit 11 shows funding trends and allocation among technologies supported under Overview and Assessment. The following subsections describe major accomplishments and planned FY 1979 activities for each program.

Environmental Policy Analysis

The Environmental Policy Analysis program is the responsibility of the Office of Technology Impacts. Various EV divisions and offices contribute to the basic information required for policy analysis. This program is the focus of EV efforts to balance national environmental and energy goals in policy formulation.

Recent accomplishments include an analysis of proposed regulations for plutonium, coal gasification, and nuclear waste management. In FY 1979, policy studies will be performed on air quality, nuclear radiation, water quality, land use, and conservation. The impact of EPA standards on stored radiation wastes will be assessed and a study of regulatory alternatives initiated.

*In this section, financial data represent operating funds in terms of budget outlays.

**Portions of the budget for Overview and Assessment relating to the functions of OTI will be restructured to reflect the organization of this new office.

TRENDS IN OPERATING FUNDS: FY 1975-FY 1979

FY 1979 OPERATING FUNDS (Millions of Dollars)

EXHIBIT 10

OVERVIEW AND ASSESSMENT: FUNDING ALLOCATION AND TRENDS

Integrated Assessment

The Integrated Assessment program is the responsibility of the Office of Technology Impacts. This program includes assessments of EH&S effects of energy systems and energy production.

In FY 1979, the National Coal Utilization Assessment will be completed. This assessment will provide valuable insight and information on the EH&S implications of increased coal consumption. Further, EH&S implications of the National Energy Act will be identified when the Act has been passed by the Con-

TRENDS IN OPERATING FUNDS: FY 1975-FY 1979

FY 1979 OPERATING FUNDS (Millions of Dollars)

EXHIBIT 11

ENERGY TECHNOLOGY SUPPORT: FUNDING ALLOCATION AND TRENDS

gress. In addition, technology assessments will be initiated for several fossil, inexhaustible, conservation, and nuclear technologies.

Environmental Engineering

The Environmental Engineering Program is administered by the Division of Environmental Control Technology. This program is the primary source in EV for technical data on environmental control capability and for the engineering expertise to apply these data to complex issues. The capability provided by this program is necessary for effective overview and input to environmental RD&D planning and policy formulation.

This program is evaluating the most critical environmental control aspects of various energy technologies such as:

- Coal: direct combustion, magnetohydrodynamics, coal gasification, coal liquefaction, and underground coal conversion
- Oil shale: in-situ processing
- Oil and gas: oil and gas extraction and transportation, and liquefied fuels safety
- Solar, geothermal and conservation: solar heating and cooling, solar agricultural and industrial process; ocean thermal conversion; magnetic fusion; and conservation in transportation, industrial processes and buildings
- Nuclear: advanced fission and fusion power generation, and seabed emplacement of radioactive wastes.

In FY 1979, these assessments will focus on high-priority issues identified in earlier studies. A liquid natural gas minimum-scale test will also be completed in FY 1979.

Operational and Environmental Safety

The Operational and Environmental Safety program, administered by the Division of Operational and Environmental Safety, ensures that DOE-controlled activities present acceptably low risks to workers and the public as well as to property and the environment. The program requires interface with appropriate DOE technology program offices to review problems associated with the operation of particular technologies, and with field organizations to review and ensure site compliance with applicable regulations.

In FY 1979, efforts will be expanded in establishing a system of risk management for DOE operations. Methods for measuring safety and health performance

will also be developed for DOE operations. In addition, a radiological survey of all Pacific Islands and atolls affected by nuclear weapons testing will be conducted in FY 1979.

Overview Management

This program is administered by the Offices of NEPA Affairs, Technology Impacts, Planning Coordination, and Program Coordination. The major overview management activities include:

- Independently reviewing, analyzing and recommending approval of all Departmental environmental impact statements (EIS's) and assessments, as well as providing technical support and policy guidance on NEPA, preparing certain legislative and policy EIS's, and analyzing EIS's of other agencies;
- Preparing Environmental Development Plans (EDP's) in collaboration with technology program offices. In FY 1979, the second annual EDP cycle will be completed and assessments initiated to support decisions with respect to the status and EH&S readiness of a technology to move into a succeeding stage of development;
- Preparing planning documents, such as:
 - Multi-year program plans and budgets, and management review and control documents,
 - The Inventory of Federal Energy-Related Environment and Safety Research which includes EH&S project information from DOE and other Federal agencies. These data are analyzed to identify research overlaps and gaps,
 - The Annual Environmental Analysis Report (AEAR), which describes potential pollutant releases from energy technology facilities, as discussed in the National Energy Policy Plan, and
 - The Market Oriented Program Planning Study (MOPPS), which describes potential technical, environmental, and economic constraints on selected technology developments;
- Providing energy-related environmental information to EV, DOE, and interested external organizations. Computer and management systems are being implemented to monitor NEPA activities and provide a capability for ready response, review, and analysis. In FY 1979, activities of the interlaboratory working group will be expanded, line access to DOE headquarters will be established, and avail-

ability of environmental impact information will be increased; and

- Coordinating with the Water Resources Council (WRC). In 1979, OTI will continue to work with WRC and the DOE technology offices to

provide regional water assessments for emerging coal, geothermal, and hydroelectric technologies. In addition, site-specific water assessments will be prepared for demonstration and commercialization projects.

Major activities for each program described above are presented in Exhibit 12.

Programs	Activities
Environmental Policy Analysis	<p>Recommend, for DOE, environmental policy which balances national environmental and energy development goals</p> <p>Conduct environmental analyses of DOE policy proposals</p> <p>Assess regulatory impacts on policy formulation and implementation</p>
Integrated Assessment	<p>Develop analytical methods and models for use in assessments</p> <p>Assess the EH&S, and socioeconomic impacts of various energy technologies</p> <p>Conduct regional comparative assessments to complement technology impact assessments</p> <p>Monitor EH&S assessment needs of Federal, regional, state, and local agencies</p>
Environmental Engineering	<p>Assess environmental control technologies for each DOE energy system and its capability to comply with existing and anticipated standards; provide input to national energy/environmental policies</p> <p>Assess adequacy of guidelines, criteria, and standards including those of other agencies; recommend action to DOE technology offices</p> <p>Provide overview and assessment of environmental and safety aspects of DOE nuclear shipment systems</p> <p>Conduct an annual inventory of the total environmental control technology effort within DOE</p> <p>Assess environmental feasibility of seabed emplacement concept for high-level radioactive waste</p>
Operational and Environmental Safety	<p>Support independent EH&S reviews and assessments associated with the pre-operational, operational, and post-operational viability of DOE RD&D programs to ensure implementation of operational policies and standards</p> <p>Support formulation and interpretation of DOE EH&S policies (directives, standards, criteria)</p> <p>Support applications engineering projects/studies to develop technical solutions for the EH&S needs of DOE operations</p> <p>Support determination of hazards to people, property, and environment of all Trusteeship Pacific islands affected by nuclear weapons testing</p>
Overview Management	<p>Coordinate preparation and review of DOE NEPA documents; independently review and analyze DOE NEPA documents and recommend approval to ASEV; provide guidance on NEPA related matters</p> <p>Conduct water quality and water supply assessments</p> <p>Coordinate and support EV planning, programming, and budgeting</p> <p>Prepare management documents (EDP's, AEAR, MOPPS, and Federal Inventory)</p> <p>Further communication on environmental issues within DOE and with other government agencies</p> <p>Develop EH&S information system network data, computer models, and data bases</p>

EXHIBIT 12

OVERVIEW AND ASSESSMENT MAJOR ACTIVITIES

Biomedical and Environmental Research

BIOMEDICAL AND ENVIRONMENTAL RESEARCH PROGRAMS

- Human Health Studies
- Health Effects Research in Biological Systems
- Environmental Studies
- Physical and Technological Studies

Biomedical and Environmental Research is the principal program area for conducting research needed to determine health and environmental effects of energy technology programs. The Division of Biomedical and Environmental Research is responsible for conducting the research programs in this area.

These programs have four major objectives:

- To ensure that increased domestic energy production is achieved with the least practicable detrimental impact on individuals and their environment;
- To determine the environmental and health effects of energy technologies and conservation and to identify methods for mitigating or eliminating adverse effects;

TRENDS IN OPERATING FUNDS: FY 1975-FY 1979

* The FY 1975 budget combined Health Effects Research in Biological Systems with Human Health Studies.

- To provide technology program offices with the information and support needed to ensure EH&S acceptability; and
- To provide a sound basis for informed public consideration of the environmental risks and cost-benefit tradeoffs involved in the development and use of energy.

Research efforts are coordinated with technology program offices within DOE to balance the objectives of achieving environmental acceptability with those of developing the energy resources required to meet national energy needs. Future developments in this research are linked to trends in technology research and development and associated unresolved EH&S issues. Research of a more fundamental nature in relation to energy development is separately funded under Life Sciences Research and Biomedical Applications.

Biomedical and Environmental Research accounts for over one-half of the total EV budget. Exhibit 13 illustrates the allocation of the FY 1979 budget request for this program area and the funding trends between FY 1975 and FY 1979. Approximately two-thirds of the requested operating funds are expected to be expended for the Environmental Studies program and the Health Effects Research in Biological Systems program.

FY 1979 OPERATING FUNDS (Millions of Dollars)

EXHIBIT 13

BIOMEDICAL AND ENVIRONMENTAL RESEARCH: FUNDING ALLOCATION AND TRENDS

Exhibit 14 shows the allocation of FY 1979 operating funds among the energy technologies supported by this program area. Research related to fossil and nuclear technologies will account for over two-thirds of the operating funds.

In recent years, greater emphasis has been placed on evaluating the EH&S effects of non-nuclear energy technologies. New studies have been initiated on many different topics:

- Increased global levels of carbon dioxide;
- Coal gasification and liquefaction;
- Fluidized-bed combustion of coal;
- Use of alternative automotive fuels;
- Production of shale oil;
- Use of various materials and heat-transfer fluids in solar heating and cooling;
- Electric and magnetic fields associated with ultra-high voltage overhead power lines; and
- Developments in magnetic fusion technology.

The following subsections describe recent accomplishments and projected FY 1979 activities for each program.

Human Health Studies

The basic objectives of the Human Health Studies program are to identify, understand, and mitigate human health problems related to energy technologies. This program seeks to ensure that the national goal of increasing domestic energy production is achieved with minimal detrimental effect on human health.

Recent achievements include:

- Characterizing harmful effects on human health resulting from exposure to chemical, physical, and biological agents associated with energy generation;
- Developing diagnostic methods for early disease detection; and
- Developing new methods for the prevention and treatment of occupational or accidental exposure to hazardous energy-related pollutants.

One notable project is the Radiation Emergency Assistance Center Training Site at Oak Ridge, Tennessee. This site is both a standby medical facility and a training facility for handling human accident cases.

In FY 1979, efforts will focus on continuing development of early indicators of human health effects of

TRENDS IN OPERATING FUNDS: FY 1975-FY 1979

FY 1979 OPERATING FUNDS (Millions of Dollars)

EXHIBIT 14

BIOMEDICAL AND ENVIRONMENTAL RESEARCH ENERGY TECHNOLOGY SUPPORT: FUNDING ALLOCATION AND TRENDS

pollutants, removal of toxic materials from biological systems, and accumulation and analysis of health and mortality data.

Health Effects Research in Biological Systems

Exposure to hazardous agents associated with energy production may seriously affect human health. The program in Health Effects Research in Biological Systems sponsors studies of animal and tissue models to predict these effects. As such, it complements the previously described program in Human Health Studies. The Health Effects program emphasizes the identification and characterization of cancer-producing agents (carcinogens) and of mutation-producing agents (mutagens), and the investigation of systems damage (toxicology).

In FY 1979, the following activities will continue:

- Examining major technology processes to identify potentially hazardous agents and to screen for carcinogens and mutagens;
- Quantifying exposures and effects; and
- Developing monitoring systems for early damage indication.

Environmental Studies

The Environmental Studies Program includes research in:

- Land and fresh water ecology;
- Physical, chemical, and biological marine sciences; and
- Atmospheric sciences, and basic studies in photosynthesis and production of biomass (i.e., plants to be used as fuels).

This program also contributes to the operation of the National Environmental Research Park Program and the Forestry Program to ensure the availability of undisturbed lands and forests for environmental research. Environmental information is used by other EV offices, such as the Office of Operational and Environmental Safety, to formulate procedures for ensuring the safety and efficiency of energy operations at DOE installations.

In FY 1979, environmental studies will continue on the detection and characterization of transport behavior, and the effects of pollutants, as well as the development of predictive models. Fossil technologies

will be the focus of the largest share of the research effort, resulting in information needed for:

- Meeting coal mining performance standards, developing regional reclamation strategies, and for determining the potential impacts of mining operations on surface water quality and biota; and
- Measuring and predicting the environmental effects of coal conversion products and effluent streams, including site-specific studies, and the environmental effects of oil and gas development on the Outer Continental Shelf and on arctic and subarctic ecosystems.

A Carbon Dioxide Effects Research and Assessment Program, initiated in 1977, is addressing the policy issues related to increased levels of atmospheric carbon dioxide and the future global use of fossil fuels. This program is an interdisciplinary, inter-agency effort to be continued in FY 1979.

Physical and Technological Studies

Within this program, the physical and chemical aspects of pollutant interactions in the environment are being studied to help identify the type and concentration of chemical species to which humans may be safely exposed. Research in radiological chemistry and physics is used to predict the effects of animal and human exposure to radiation. Characterization, measurement, and monitoring are emphasized to provide better data on potentially hazardous pollutants and on disturbances resulting from energy technologies.

Current studies focus on gasifiers in industry; fluidized bed combustion; Paraho oil shale retorting in Colorado; geothermal technology in Imperial Valley, California, and solid waste combustion technology. Planned studies for FY 1979 include coal liquefaction and in situ oil shale retorting.

Energy Technologies Supported by Biomedical and Environmental Research

The research programs previously discussed support a broad spectrum of energy technology development: fossil fuels, nuclear energy, inexhaustible fuels, and multitechnologies. Exhibit 16 identifies selected technology-specific activities funded under the Biomedical and Environmental Research program area.

Exhibit 15 presents the major activities for each program described above.

Programs	Activities
Human Health Studies	<p>Ascertain the current state of knowledge of specific health problems related to energy pollutants</p> <p>Characterize susceptible populations</p> <p>Develop methods to ensure consistent monitoring of somatic and genetic health effects</p> <p>Collect baseline information on the health status of exposed and unexposed populations, as well as those subject to future exposure to energy pollutants</p> <p>Establish relationships between effluent levels and morbidity and mortality levels in the population through epidemiological studies</p>
Health Effects Research in Biological Systems	<p>Identify hazardous chemical and physical agents</p> <p>Characterize adverse health effects</p> <p>Develop mitigative and preventive measures</p> <p>Develop methods for early detection of health effects</p> <p>Obtain quantitative data on dose-response relationships</p> <p>Integrate quantitative data into models that can be used to estimate human health risks</p> <p>Validate predictive estimates with available epidemiological and clinical studies in humans</p> <p>Provide guidance for control technology, safety regulations and monitoring</p>
Environmental Studies	<p>Characterize the properties, transport, characteristics, and transformations of energy-related pollutants in the atmosphere, in water, and on land</p> <p>Identify the major pathways by which these pollutants are transferred through the biotic compartments of the environment and determine the rates of transfer</p> <p>Describe and assess ecological responses to pollutants and other stresses related to energy technology development</p> <p>Determine mechanisms by which human populations and ecosystems can accommodate stresses; evaluate rates of recovery</p> <p>Determine the effects of massive physical environmental disturbances and disruptions on the environment</p> <p>Define management strategies for atmospheric, water, and land resources subject to impact during energy development</p> <p>Develop and evaluate measures to eliminate pollutant pathways to man or to mitigate impact on the environment</p> <p>Develop methods for early detection of changes in environmental systems</p> <p>Perform fundamental research on constraints to biomass production</p>
Physical and Technological Studies	<p>Obtain improved characterization of chemical transformations in the atmosphere</p> <p>Develop more accurate methods for determining low-dose radiation effects</p> <p>Determine the range of elemental, chemical and particulate emissions from new energy technology processes</p> <p>Prepare, characterize and distribute representative research materials for biological-effects research</p> <p>Develop improved health protection methodology</p> <p>Develop advanced measurement systems, particularly for determination of organic species</p>

EXHIBIT 15

BIOMEDICAL AND ENVIRONMENTAL RESEARCH

MAJOR ACTIVITIES

Technology	Activity
Fossil Fuel (coal, oil and gas, oil shale)	Characterize and monitor pollutants from fossil energy operations Determine the transport, conversion, and accumulation of pollutants associated with fossil energy operations in the atmosphere and coastal waters Determine toxicological, carcinogenic, mutagenic, developmental, and pathological effects of fossil energy pollutants on humans, other animals and plants Investigate the potential global effects of carbon dioxide associated with increased coal combustion Complete baseline and effects studies of the recovery and transport of oil and gas from Alaska Develop acceptable options for reclamation of deep-mining spoils sites and strip-mined lands
Nuclear	Develop improved instrumentation and techniques for measuring low doses of radiation Determine translocation, distribution, and retention of fission products in atmospheric, aquatic and terrestrial media Determine toxic, carcinogenic, and mutagenic effects of fission products and other forms of radiation on humans, other animals, and plants
Inexhaustibles (solar, geo- thermal, fusion, and conserva- tion)	Characterize emissions from alternative automobile fuels and combustion of solid waste Determine the biological effects of these emissions on humans, other animals, and plants Characterize the release, transport, and environmental and health effects of materials and heat transfer fluids used in solar heating and cooling Determine the environmental and health effects of emissions associated with production of geo-thermal energy Determine the biological effects of electric and magnetic fields Determine the biological effects of tritium, and materials used in advanced storage batteries Determine the health hazards related to the production and use of insulating materials
Multi- technology	Characterize physical, chemical, and biological processes in the atmosphere and coastal waters Determine the physical, chemical, and thermal effects of powerplant cooling systems on animals and plants Develop improved monitoring devices and concepts Develop improved diagnostic techniques for human illnesses associated with energy pollutants

EXHIBIT 16

BIOMEDICAL AND ENVIRONMENTAL RESEARCH TECHNOLOGY SUPPORT ACTIVITIES

Life Sciences Research and Biomedical Applications

The Life Sciences Research and Biomedical Applications programs under the Division of Biomedical and Environmental Research provide basic information on the structure and function of living organisms, and investigate radiation and isotopic materials used in the diagnosis and treatment of human diseases.

The following subsections describe the recent accomplishments and planned FY 1979 activities for each program.

Exhibit 17 illustrates the allocation of the FY 1979 requested budget and the funding trends. In FY 1979, General Life Sciences research will account for approximately 60 percent of the total budget for this program area.

General Life Sciences

The General Life Sciences program consists of long-term research designed to develop better knowledge of the basic structure and function of living organisms (including humans) and of pollutant effects

TRENDS IN OPERATING FUNDS: FY 1975-FY 1979

FY 1979 OPERATING FUNDS (Millions of Dollars)

EXHIBIT 17

LIFE SCIENCES RESEARCH AND BIOMEDICAL APPLICATIONS FUNDING ALLOCATION AND TRENDS

on these organisms. Activities in this program supply essential information for developing methods to detect biological damage, for reducing the uncertainty in extrapolating risk estimates to humans, and for other applied research efforts.

Recent accomplishments in this program include development of a rapid screening system to detect mutations, characterization of phospholipid cell membrane molecules, and identification of an enzyme that repairs ultraviolet ray damage in human cells. Advances in cancer research have been particularly noteworthy. New emphasis is being placed on certain health effects of energy-related pollutants.

In FY 1979, studies will be conducted to define the basic mechanisms of mutagenesis and to redefine the relationship between mutagenesis and carcinogenesis. The sensitivity of cellular tissue cultures to pollutants will be determined, and the relationship between cellular changes and tissue pathologies will be established.

Also in FY 1979, biological studies of the structure, function, stability, and health of selected ecosystems will be conducted in order to compare normal and pollutant-affected systems. In addition, investigations on the development of biological systems for energy conversion, conservation, and resource recovery are included to provide a basis for

enhanced production of fuels and chemicals by plants and microbial action.

Biomedical Applications

The Biomedical Applications program facilitates transfer of nuclear technology to medical science and provides the medical community with advanced diagnostic and therapeutic methods. Research within this program includes medical applications of nuclear technology, and the production and medical application of stable isotopes.

Research on stable isotopes applications yields specific information on the abnormal metabolic processes that underlie disease and the behavior of pollutants in living organisms and in the environment at large. Previous efforts on nuclide production, compound labeling, and diagnostic techniques for early detection of systems changes will be expanded.

Planned activities in FY 1979 include:

- Evaluating the krypton-81m-ventilation technique for early diagnosis of black lung disease and other pulmonary diseases;
- Initiating new activities in the nuclear technology area to increase radionuclide and radiopharmaceutical production;

Exhibit 18 presents the major activities conducted within each program described above.

Scientist examining pile worms from the bed of the Salton Sea, California, as part of geothermal energy environmental studies

Program	Activities
General Life Sciences	<p>Investigate the basic mechanisms of mutagenesis, including damage and repair of genetic material</p> <p>Redefine the relationship between mutagenesis and carcinogenesis</p> <p>Investigate the structure of macromolecules and determine changes resulting from exposure to energy-related pollutants</p> <p>Develop and apply physical techniques to determine the structure of cell membranes and cell organelles</p> <p>Investigate the molecular structure of and replication mechanisms for genetic material</p> <p>Establish cellular cultures of tissues sensitive to pollutants</p> <p>Investigate the relationship between cellular changes and tissue pathologies</p> <p>Investigate photosynthesis and other related topics involved in biological energy conversion</p>
Biomedical Applications	<p>Develop advanced instrumentation to evaluate pollutant effects on biological systems</p> <p>Develop techniques for production and imaging of radionuclides</p> <p>Develop new technology and procedures for use in early diagnosis and treatment of human diseases</p>

EXHIBIT 18

LIFE SCIENCES RESEARCH AND BIOMEDICAL APPLICATIONS MAJOR ACTIVITIES

- Initiating studies to determine the feasibility of using heavy ions for clinical therapy and radiography via Bevalac, the heavy ion accelerator; and
- Continuing the development of more sensitive indicators of disease and disease processes.

Decontamination and Decommissioning

DECONTAMINATION AND DECOMMISSIONING PROGRAMS

- Management of Surplus Radioactively Contaminated DOE Facilities
- Remedial Actions for Former MED/AEC sites
- Remedial Actions for Inactive Uranium Mill Tailing Sites
- Remedial Actions for Uranium Mill Tailings at Grand Junction, Colorado

The overall objective of the Decontamination and Decommissioning programs conducted by the Division of Environmental Control Technology is to reduce the potential environmental hazards associated with sites and facilities formerly used in the nation's nuclear programs and which are no longer required. These programs are responsible for both government-owned surplus property and private property where

activities involving handling of radioactive materials (principally uranium ores) were conducted and have the goal of minimizing human risks and restoring sites and facilities to alternative beneficial uses. Projected FY 1979 funding and five-year trends are shown in Exhibit 19.

Management of Surplus Radioactively Contaminated DOE Facilities

The program's objective is the maintenance of safe management and disposition of DOE facilities that are radioactively contaminated and have been declared surplus to programmatic needs. The current inventory of DOE surplus facilities identifies about 450 facilities.

Since initiation of the program in 1973, three reactors (at Elk River, Minnesota; Idaho Falls, Idaho; and Santa Susana, California) have been decommissioned. Fifteen additional decommissioning projects are in progress, including salvage of radioactive fuels from the nuclear rocket program at the Nevada test site. In FY 1979, the program will be expanded to implement a DOE plan to dispose of high-priority facilities at Oak Ridge National Laboratory, Tennessee; Mound Facility, Ohio; and Hanford Engineering Development Laboratory, Washington; while maintaining surveillance and monitoring activities at other facilities in the inventory. New disposition methods will be funded, and new planning efforts for DOE nuclear facilities will be initiated.

TRENDS IN OPERATING FUNDS: FY 1975-FY 1979

FY 1979 OPERATING FUNDS (Millions of Dollars)

EXHIBIT 19

DECONTAMINATION AND DECOMMISSIONING: FUNDING ALLOCATION AND TRENDS

Remedial Actions For Former MED/AEC Sites

Eighty former AEC and Manhattan Engineer District sites were reviewed to verify that they had been sufficiently decontaminated to permit release for unrestricted use, in some cases to non-government owners. Forty-three of these require additional radiological surveys for verification due primarily to insufficient documentation of previous decontamination. About 29 will require some additional decontamination, ranging from simple, localized cleanup to major excavation, removal, and dismantlement of facilities. The FY 1979 effort will continue to define the remedial actions that are required and to begin the work needed to restore them to conditions suitable for unrestricted use.

Remedial Actions for Inactive Uranium Mill Tailings Sites

At present, there are 22 inactive uranium mill tailings sites in eight western states. These sites must be treated to prevent airborne and groundwater contamination from becoming a public health hazard. Radiation surveys, to be completed in FY 1979, will be followed by engineering evaluations. Rehabilitation or other corrective measures will not be started until Congress passes legislation to authorize DOE to do the remedial work. Preliminary surveys, engineering assessments, environmental impact assessments and

all other preparatory steps are in process in anticipation of the authorization to perform the rehabilitation.

Remedial Actions for Uranium Mill Tailings at Grand Junction, Colorado

This program originated in 1973 with the enactment of PL 92-314. The objective of the program is to limit radiation exposure resulting from the use of uranium mill tailings in construction at Grand Junction, Colorado. Approximately 600 contaminated structures had been identified as of the beginning of FY 1977. Some 250 structures have been decontaminated at a cost of \$3.6 million. Eighty additional structures will be decontaminated in FY 1979. The State of Colorado contributes one-fourth of the total cost.

Light Water Reactor Facilities

The Light Water Reactor Facilities program provides the Loss-of-Fluid Test (LOFT) and supporting facilities for the conduct of NRC's reactor safety confirmatory research program. It is administered by the Office of Nuclear Safety Coordination. The major objective in FY 1979 will be to complete the LOFT Facility and to obtain its acceptance by the Nuclear Regulatory Commission (NRC) for the conduct of its nuclear experimental program.

The LOFT facility, located at the Idaho National Engineering Laboratory, is designed to study the performance of engineering safety systems during a hypothetical loss-of-coolant accident. This is considered to be one of the most important safety issues in the operation of commercial pressurized water reactors. The LOFT system was specially designed to permit study of the engineered safety systems, including the emergency core cooling systems, and to obtain appropriate experimental data in order to assess the performance and effectiveness of such systems under simulated accident conditions.

Prior to FY 1977, this project was funded by the NRC. The FY 1979 DOE budget allocates \$16 million to the LOFT Facility program. After FY 1979, funding by DOE may no longer be required. However, the Office of Nuclear Safety Coordination will continue to coordinate the use of DOE facilities by NRC.

The FY 1979 budget will also support reactivation of the Idaho Radioactive Material Laboratory, the

Chemical technician examines a "button" of plutonium

Hot Cell Annex, and the spent-fuel storage pool. This project, in conjunction with a FY 1978 project, will modify and upgrade existing facilities for the examination, disassembly and storage of radioactive components, including fuel assemblies associated with the LOFT project at Idaho National Engineering Laboratory.

Exhibit 20 presents the major activities conducted within each program described above.

Performing Institutions

The major portions of EV programs are performed by contractors and are managed primarily by the Division of Biomedical and Environmental Research. These contractors include multi-program and other DOE laboratories; Energy Research Centers; universities; industrial and other firms; and other Federal agencies. DOE laboratories perform about two-thirds of the research. Exhibit 21 shows the allocation of funds among performing institutions and funding trends between FY 1977 and FY 1979. Appendix C provides examples of EV programs at selected DOE laboratories.

TRENDS IN OPERATING FUNDS: FY 1977-FY 1979

EXHIBIT 21

ALLOCATION OF RESEARCH FUNDS TO PERFORMING INSTITUTIONS: FY 1977-1979

Programs	Activities
Management of surplus radioactively contaminated DOE facilities	Maintain surveillance, conduct R&D, and plan and execute disposition projects for about 450 currently identified facilities
Remedial actions for former AEC contractor installations	Resurvey 43 decontaminated sites (released for unrestricted use) due to insufficient documentation of remedial actions. Develop engineering requirements and conduct remedial actions to establish unrestricted conditions
Remedial actions for inactive uranium mill tailings sites	Eliminate radiological health concerns at 22 inactive uranium mill tailings sites
Remedial actions for uranium mill tailings at Grand Junction, Colorado	Decontaminate 600 structures

EXHIBIT 20

DECONTAMINATION AND DECOMMISSIONING MAJOR ACTIVITIES

Appendix A

DEPARTMENT OF ENERGY ORGANIZATION CHART

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Appendix B

List of EV Principals

Office of the Assistant Secretary for Environment

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	(202)376-4185
Dorothy H. Fauntleroy, Executive Assistant	(202)376-4189
George R. Shepherd, Special Assistant	(301)353-4732
John C. Whitnah, Director, Planning, Program and Management Coordination	(301)353-5268
W. J. Little, Jr., Director, Office of Planning Coordination	(202)376-4191
	(301)353-3285
Herbert G. Fish, Acting Director, Office of Program Coordination	(301)353-3541
Donald E. Shaw, Director, Office of Management Coordination	(301)353-4223
Joel B. Stronberg, Acting Staff Director, Institutional Relations	(202)376-4185

Division of Biomedical and Environmental Research

William W. Burr, Jr., Acting Director	(301)353-3153
Charles W. Edington, Associate Director for Research and Development Programs	(301)353-3251
Charles E. Carter, Manager, Biomedical Programs	(301)353-5468
Jeff Swinebroad, Manager, Environmental Programs	(301)353-4208
Robert W. Wood, Manager, Physical and Technological Programs	(301)353-3213
Walter H. Weyzen, Manager, Human Health Studies Programs	(301)353-5355
David H. Slade, Acting Director, Office of Carbon Dioxide Effects Research and Assessment	(301)353-4374

Division of Environmental Control Technology

William E. Mott, Director	(301)353-3016
Robert W. Ramsey, Assistant Director of Nuclear Program	(301)353-5028

Office of Technology Impacts

Peter W. House, Director	(202)376-1820
Joseph A. Coleman, Deputy Director	(202)376-1820
Kenneth R. Woodcock, Acting Deputy Director for Special Projects	(202)566-9753

Edward R. Williams, Director, Division of Policy Analysis	(202)376-9073
Dario Monti, Director, Division of Technology Assessment	(202)566-9741
Roger D. Shull, Director, Division of Environmental Impacts	(301)353-3311
Roger D. Shull, Acting Director, Division of Regional Assessments	(301)353-4258

Office of Nuclear Safety Coordination

Robert W. Barber, Director	(301)353-3548
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Division of Operational and Environmental Safety

Hal Hollister, Director	(301)353-3157
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Office of NEPA Affairs

Robert J. Catlin, Acting Director	(301)353-5173
W. Herbert Pennington, Director, Division of Program Review and Coordination	(301)353-4241
Robert J. Stern, Director, Division of Policy and Planning	(202)566-9760

Appendix C

Examples of EV Programs at Selected Laboratories

Field Organization	Location	Energy-Related Environmental Activities
Multi-Program		
Argonne National Laboratory	Argonne, IL	Conducts environmental control investigations for coal, regional studies, and environmental policy analyses; conducts research on pulmonary effects, toxicity of internally deposited radionuclide and fluidized bed combustion products, mutagenic and lethal DNA effects, and molecular physics and chemistry of nonnuclear atmospheric pollutants; conducts environmental studies on coal combustion, extraction, conversion, and land reclamation.
Brookhaven National Laboratory	Upton, Long Island NY	Conducts integrated assessments of coal, oil and gas, energy conversion, and solar energy technologies; conducts research on acute and long-term somatic effects of pollutants, systems damage screening techniques, air quality, and land and oceanic environments; conducts studies in pulmonary toxicology and molecular biology.
Lawrence Berkeley Laboratory	Berkeley, CA	Conducts research on radiation biology, human health effects of energy-related pollutants, and radiation effects; studies biological energy conversion; produces assessments of biological, chemical, physical, environmental, and socioeconomic effects of energy technologies.
Lawrence Livermore Laboratory	Livermore, CA	Conducts integrated assessments of geothermal energy, in-situ coal gasification, and associated environmental controls; conducts research on carcinogenesis, cytogenetics, mutagenesis, radionuclides, transuranics, plant stress, and health effects of geothermal energy production; produces environmental studies of coal plant emissions.
Los Alamos Scientific Laboratory	Los Alamos County, NM	Conducts environmental policy analyses, regional and environmental control assessments, and ecological studies; conducts research in epidemiology, tumorigenic risk, mutagenesis, oil shale toxicology, and radioactive mate-

		rials in waste discharge areas; develops advanced pollutant measurement techniques; maintains a National Environmental Research Park.
Oak Ridge National Laboratory	Oak Ridge, TN	Conducts analyses of environmental policy, solid waste control, and coal technology health and environmental effects; conducts studies in basic ecosystem processes, carcinogenesis and mutagenesis testing, toxicologic effects, and biotechnology.
Pacific Northwest Laboratory	Richland, WA	Conducts environmental policy analyses and integrated assessments of oil, gas, oil shale, and environmental control technologies; conducts research on strip-mined land reclamation, waste treatment, effluent measurement and characterization, occupational health, and effects of energy-related materials and other pollutants; maintains a National Environmental Research Park.
Sandia Laboratories	Albuquerque, NM	Conducts research on nuclear waste management, LWR safety, environmental policy analysis, atmospheric pollution, and transport of nuclear materials.
EV Laboratories		
Center for Energy and Environmental Research	San Juan, Puerto Rico	Conducts research in disease prevention, diagnosis and therapy, and control of environmental hazards in tropical ecosystems.
Comparative Animal Research Laboratory	Oak Ridge, TN	Studies short-term acute and long-term somatic effects of radiation, genetic effects of pollutant exposure, biological transport of toxic materials, and genetic damage detection.
Environmental Measurements Laboratory	New York, NY	Conducts research on radiation and aerosol measurement techniques; quantifies nuclear and nonnuclear pollutants in the environment.
Franklin McLean Memorial Institute	Chicago, IL	Conducts research on radiation effects and biomedical applications of radioactive materials; analyzes and evaluates imaging systems.
Inhalation Toxicology Research Institute	Albuquerque, NM	Defines and characterizes energy-related airborne materials; studies the effect of toxic inhalation on man and animals.
Laboratory of Nuclear Medicine and Radiation Biology	Los Angeles, CA	Conducts research on health effects of pollution, genetic effects of radiation, imaging technology, utilization of radioactive materials, and diagnostic techniques for biological systems.
Michigan State University Plant Research Laboratory	East Lansing, MI	Conducts research on plant growth, development, stress effects, and mechanisms of how plants react to atmospheric pollutants.
Davis Radiobiology Laboratory	Davis, CA	Conducts research on aerosol characterization, toxicological assessment, and detection and characterization of radiation effects.
Oak Ridge Associated Laboratories	Oak Ridge, TN	Conducts research on nuclear facility health and mortality, pulmonary pollutant damage, and immunology; maintains a radiation emergency assistance center.

San Francisco Laboratory of Radiobiology	San Francisco, CA	Studies the genetic, developmental, and physiological effects of energy-related contaminants.
Savannah River Ecology Laboratory	Aiken, SC	Conducts research on the environmental effects of cooling water discharged from nuclear reactors, the movement of heavy metals and radioisotopes, and basic and theoretical ecology; maintains a National Environmental Research Park.
University of Rochester Biomedical Laboratory	Rochester, NY	Conducts research in biological effects of high voltage electrical fields, toxicology, biochemistry, and mechanisms of damage related to fossil fuel combustion.
University of Utah Radiobiology Laboratory	Salt Lake City, UT	Conducts research on carcinogenic effects of radioactive materials and toxic metal removal from biological systems.
Other Laboratories		
Ames Laboratory	Ames, IA	Conducts research on the isolation, characterization, and quantification of biologically active inorganic and organic pollutants; investigates environmental control requirements for solid waste processing and solar energy.
Hanford Engineering Development Laboratory	Richland, WA	Conducts research on long-term occupational effects and other nuclear energy health and safety effects.
Idaho National Engineering Laboratory	Idaho Falls, ID	Develops instrumentation and information systems; conducts tranuranic analyses for waste management; maintains a National Environmental Research Park.
Notre Dame Radiation Laboratory	Notre Dame, IN	Conducts research on the mechanisms of chemical changes that follow the absorption of high-energy radiation and light.
Radiation Effects Research Foundation	Japan	Conducts joint studies with Japanese scientists at Hiroshima and Nagasaki on specific diseases and other physiological phenomena resulting from radiation exposure.
Energy Research Centers		
Laramie ERC	Laramie, WY	Conducts assessments of underground coal gasification effects on ground water quality.
Morgantown ERC	Morgantown, WV	Conducts research on health effects of coal particulates.
Pittsburgh ERC	Pittsburgh, PA	Investigates treatment of synthane gasification wastewater and control of fugitive emissions from coal liquefaction processes.