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Nuclear Waste Management Program Summary Document

FY 1981

March 1980

U.S. Department of Energy
Assistant Secretary for Nuclear Energy
Office of Nuclear Waste Management

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U.S. Department of Energy
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Washington, D.C. 20545

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PREFACE

The Nuclear Waste Management Program Summary Document outlines the operational and research and development (R&D) activities of the Office of Nuclear Waste Management (NEW) under the Assistant Secretary for Nuclear Energy, U.S. Department of Energy (DOE). This document focuses on the current and planned activities in waste management for FY 1981.

This Program Summary Document (PSD) was prepared in order to explain the Federal nuclear waste management and spent fuel storage programs to Congress and its committees and to interested members of the public, the private sector, and the research community.

The national energy policy as it applies to waste management and spent fuel storage is presented first. The program strategy, structure, budget, management approach, and public participation programs are then identified. The next section describes program activities and outlines their status. Finally, the applicability of departmental policies to NEW programs is summarized, including field and regional activities, commercialization plans, and environmental and socioeconomic implications of waste management activities, and international programs.

This Nuclear Waste Management Program Summary Document is meant to serve as a guide to the progress of R&D and other energy technology programs in radioactive waste management. The R&D objective is to provide the Nation with acceptable solutions to short- and long-term management problems for all forms of radioactive waste and spent fuel.

Sheldon Meyers

Sheldon Meyers
Deputy Assistant Secretary for
Nuclear Waste Management

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I. U.S. ENERGY POLICY

Comprehensive statements of national energy measures and strategies have been set forth in the National Energy Plan (NEP) of 1977 and the NEP II of 1979. Both provide strategies and energy proposals to help solve near and long term energy problems facing the country. Both also acknowledge that, in the near and long term, nuclear energy will be an integral part of the total energy picture of the country. This Program Summary Document describes the U.S. Department of Energy (DOE) programs which have been established to manage the byproducts of our country's nuclear programs-- radioactive nuclear waste. Radioactive waste management policy is designed to protect public health, public safety, and the environment from radioactive materials resulting from national defense programs, energy research and development (R&D), and commercial activities. Chapter I discusses the general outline of the NEP.

A. THE NATIONAL ENERGY PLAN AND ACT

On April 29, 1977, the Administration submitted to Congress the first NEP, accompanied by legislative proposals designed to produce a coherent energy policy for the United States. The National Energy Act (NEA), passed by Congress in mid-October 1978, allows implementation of vital parts of the NEP. NEP II was submitted to Congress on May 7, 1979, accompanied by additional legislative proposals further defining the energy policy.

The NEP II recognizes that petroleum and natural gas resources cannot continue indefinitely to support the present high rates of growth in energy consumption. To meet the demand for oil, the United States has turned increasingly to imports. This has resulted in progressively greater dependence on an uncertain future world oil market and, therefore, growing

vulnerability to supply interruptions. With this situation confronting the United States, the NEP II establishes three overriding energy objectives:

> As an immediate objective that will become even more important in the future, the Nation must reduce its dependence on foreign oil and vulnerability to oil supply interruptions.
>
> In the mid term, the Nation must seek to (1) keep imports sufficiently low to protect U.S. security and to extend the period before world oil demand reaches the limits of production capacity and (2) develop the capability to use new, higher priced ("backstop") technologies as world oil prices rise.
>
> The Nation's long-term objective is to have renewable and essentially inexhaustible sources of energy to sustain a healthy economy.

To accomplish the above objectives of NEP II, the Administration has formulated the following strategies and goals:

Conservation:	. . . reduce the rate of growth in demand for energy and . . . improve the productivity of energy use.
Oil:	. . . provide financial incentives and reduce institutional barriers to raise oil production.
Natural Gas:	. . . use the temporary domestic surplus of natural gas to substitute for oil imports while providing incentives to increase conventional domestic production.
Coal:	. . . priority will be given to programs which increase the use of coal in place of oil and natural gas wherever economically and environmentally feasible. Research, development, and demonstration (RD&D) will continue to support advanced environmental control technologies, coal liquefaction, and advanced coal conversion systems.
Nuclear:	. . . develop safeguards that will allow light water reactors (LWR's) to continue to meet an increasing share of electrical energy needs while incorporating the lessons learned at Three Mile Island. R&D on advanced fission concepts, fusion, and breeder reactors will continue.

Renewable Energy Sources:	. . . enhance the Nation's capacity to use renewable resources. Financial incentives and RD&D will continue in the areas of solar and geothermal energy.

The NEA of 1978 and the companion legislative proposals to NEP II are intended to meet specific goals. If additional successful programs are established, the Nation will further reduce its dependence on foreign petroleum supplies, decrease susceptibility to supply interruptions of both oil and natural gas in the near term, and weather the period when world oil demand begins to outstrip supply. The goals of NEP and NEA may be achievable by placing additional emphasis in the near term on alternative conventional energy sources, such as coal and LWR's.

NEP II, as submitted to Congress on May 7, 1979, continued to support strategies developed as part of the NEP of 1977. Both stressed the conclusion that in the near term ". . . coal and nuclear power--especially coal--will emerge as the critical transition fuels. . ." (NEP II, p. II-25). Long-term solutions to the energy problems faced by the Nation are currently being examined through DOE funding for the development of a broad spectrum of solar energy technologies, nuclear fusion, and breeder reactors. Hence, both the near- and long-term energy strategies include continued development and use of nuclear reactors, including the LWR operating in a once-through fuel-cycle mode.

Commercial use of LWR's has been underway for more than a decade. As with the introduction of any new technology, LWR deployment has had difficulty overcoming both institutional and technical obstacles to complete technology development. One of the incomplete aspects of the LWR and defense weapons programs is that the long-term waste management program for nuclear wastes is still in an early stage of development. Several States have adopted or are considering measures which effectively preclude LWR development until long-term waste disposal techniques are demonstrated by the Federal Government. Similarly, transportation of nuclear waste is receiving attention at both the State and Federal levels. Several States and municipalities have adopted or are considering measures to restrict, if not totally preclude, the movement of nuclear materials. Therefore, appropriate Federal emphasis must be placed on developing and implementing appropriate and successful waste management techniques and associated transportation support.

B. THE NEA AND NUCLEAR WASTE MANAGEMENT

One objective of the NEA and accompanying legislation to NEP II is to enhance the potential for increased near-term commercial deployment of LWR's. Because LWR's produce radioactive waste which must be managed by interim storage and ultimate disposal, the safe management of nuclear wastes is fundamental to meeting environmental protection goals associated with energy development goals. In addition, some recent State legislative actions have effectively precluded the nuclear option until safe nuclear waste management is demonstrated.

Under Federal statutes and regulations, long-term management facilities for high-level waste (HLW) from both commercial and defense sources must be in Federally licensed, Federally owned facilities or specifically exempted from such control by Federal law. (The applicable regulations for commercial waste are in 10CFR50, Appendix F, and for defense waste, the Energy Reorganization Act of 1974.) The emphasis of the commercial waste program is to construct several radioactive waste repositories in geologic formations in order to provide disposal of HLW generated by civilian operations. In addition, these repositories could be available for the disposition of any high-level radioactive waste under Federal custody.

By law and in view of public concerns, DOE cannot unilaterally decide on and implement a course of action for the long term waste disposal program. The public, the States, interest groups, and other Federal agencies are involved in the DOE decisionmaking process through the provisions of the 1969 National Environmental Policy Act (NEPA) and the regulatory and budget processes of Federal and State agencies. For example, the Energy Reorganization Act of 1974 requires that facilities for the long term storage of HLW be licensed by the Nuclear Regulatory Commission (NRC). DOE's programs, therefore, involve decisionmaking phases followed by an implementation phase with provisions throughout for involvement of the public, their representatives, and appropriate Federal and State agencies.

Two policy decisions made by President Carter in 1977 have major impact on the U.S. nuclear fuel cycle and waste programs:

- The reprocessing of spent fuel from commercial reactors was indefinitely deferred (April 7, 1977).
- The Federal Government offered to take title to spent reactor fuel (October 18, 1977).

These new policies emphasize fuel/resource conservation, more efficient separation of uranium-235 from natural uranium, the search for nuclear fuel cycles that can meet nonproliferation criteria, and long-term management of spent fuel. Accordingly, there is less need to further develop commercial fuel reprocessing and to provide for the disposal of wastes from such reprocessing.

DOE has management responsibility for all defense nuclear waste, commercial spent fuel assigned to DOE, and commercial high-level nuclear waste in Federal custody. DOE also has the responsibility for ensuring that transportation systems exist to support Federal programs. This authority is derived through the Atomic Energy Act of 1954, the Energy Reorganization Act of 1974, the DOE Organization Act of 1977, and Federal regulations. Thus, DOE is responsible for formulating strategies and implementing a program for the long-term management of highly radioactive wastes. The magnitude of this responsibility becomes evident when consideration is given to the current and projected inventories of defense and commercial waste volumes for HLW, transuranic (TRU) waste, and low-level waste (LLW) listed below.

Table I-1. Inventories of Defense and Commercial Nuclear Waste Volumes

WASTE TYPE		VOLUME ($10^3 m^3$)			
		DEFENSE		COMMERCIAL	
		CURRENT[1]	PROJECTED TO YEAR 2000	CURRENT[2]	PROJECTED TO YEAR 2000
HLW	SOLID	182	250[3]	2	37
	LIQUID	101	70[3]	2.3	2.3
TRU WASTE		311	500-3350[4]	0	6
LLW		1470	2500-6800[4]	5.5	2800-7800

Source: IRG Report, Appendix D, except as footnoted below.

[1] As of October 1, 1978.

[2] Commercial solid HLW reflects spent fuel. Currently there are about 4,000 metric tons of reactor spent fuel being stored in reactor basins. There could be as much as 95,000 metric tons of spent fuel discharged by the year 2000. If the spent fuel were reduced and stored as HLW, the volume would be reduced by a factor of about 10.

[3] Maximum volume case assumed.

[4] Range depends on extent of decontamination and decommissioning (D&D) activities.

In addition, DOE is responsible for future wastes generated by defense, test, and research nuclear programs as well as the spent fuel and other HLW from the commercial nuclear power program.

The successful long-term management of nuclear wastes is dependent on satisfying institutional, political, environmental, and technical constraints. During the past 30 years, management of defense wastes has provided a basis for the technology of nuclear waste disposal.

Although specific designs are incomplete and facilities are unavailable for permanent disposal of high-level radioactive waste, permanent disposal of HLW in geologic formations can be safely achieved. The technology exists for the identification of specific sites for such disposal, according to a consensus of scientific opinion. A number of major institutional issues must still be resolved before DOE can demonstrate the safe management of nuclear wastes. For permanent disposal planning purposes, wastes are defined to include unreprocessed spent fuel and wastes that would result from fuel reprocessing if that option were exercised in the future.

DOE conducts R&D, testing, and design work to enable timely implementation of the most promising alternatives for commercial and defense wastes. This work is carried out with full public disclosure through public reports, informational meetings, Environmental Impact Statements (EIS's), and regulatory proceedings, where required.

C. SPENT FUEL POLICY

On April 7, 1977, President Carter announced that the United States would defer indefinitely all civilian reprocessing of spent nuclear fuel. Therefore, the possibility that spent fuel will be discarded as waste must be seriously considered by waste management programs, and appropriate accommodations must be made. The fundamental reason for establishing this policy was a concern that the widespread separation of plutonium from the other products of fission contained in spent nuclear fuel could lead to the proliferation of nuclear weapons. This significant policy change in the use of nuclear fuel stock was first identified in President Ford's policy statement on October 26, 1976, which raised the possibility of a ban on reprocessing until a better institutional basis could be developed to avoid the risks of nuclear weapons proliferation.

This policy change stopped industry's plans for the development and use of reprocessing and ancillary processes. Although onsite commercial reactor spent fuel storage basin modifications (such as installing closely spaced storage racks) can provide additional near-term storage, by the mid-1980's some basins will still have inadequate capacity to handle the fuel being discharged. Additional storage could be provided by either an away-from-reactor (AFR) storage basin or a disposal facility.

To support the nonproliferation policy and to meet the need for additional spent fuel storage, DOE, with the approval of the President, announced on October 18, 1977, more detailed plans for spent fuel policy implementation. In return for payment of a one-time, usage-based storage fee, the Government offered to take title to and store spent nuclear fuel from commercial power reactors. This policy is intended to provide for interim spent fuel storage until a disposal facility is available or reprocessing is permitted. Consideration will also be given to the storage of spent fuel from foreign reactors.

Within DOE, two separate spent fuel activities--storage and disposal--have been assigned to the Office of the Assistant Secretary for Nuclear Energy (ASNE). Within Nuclear Energy (NE), spent fuel disposal activities and HLW disposal responsibilities are both assigned to the Office of Nuclear Waste Management (NEW). Accordingly, the National Waste Terminal Storage (NWTS) Program is directed to provide geologic disposal capability regardless of whether the material is in the form of spent fuel or solidified waste from a fuel reprocessing operation. Storage activities support the indefinite deferral of spent fuel reprocessing, and are separated in budget and management areas from civilian and military nuclear waste disposal programs.

D. DOE POLICY AND THE NATIONAL ENVIRONMENTAL POLICY ACT

The NEPA of 1969, implemented by Executive Order 11514 and dated March 5, 1970 (35 FR 4247), and the Guidelines of the Council on Environmental Quality (CEQ) of November 29, 1978 (40 CFR Part 1500, 38 FR 20500), require all Federal agencies to prepare detailed statements on the environmental implications of proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. The objective of NEPA is to build appropriate and careful consideration of environmental aspects of proposed actions into the Federal agency decisionmaking process, beginning at the earliest possible point.

In its planning and decisionmaking processes, DOE considers the possible consequences of its proposed actions by the following:

- Evaluation of both the long- and short-term implications of DOE actions to man, including his physical and social surroundings, and to nature
- Exploration, development, and analysis of alternative actions
- Identification of the potential environmental effects of such proposed actions to agencies and other decision-makers, including Congress and the President, and to the public

Two types of NEPA documents identify the environmental aspects of Federal programs: Environmental Assessments (EA's) and EIS's (either generic or program specific). An EA is prepared to assess whether a proposed DOE action would be "major" and would "significantly affect" the quality of the environment. It serves as the basis for determining whether an EIS is required. Two decisions can be made based upon an EA: either a negative determination, which signifies that an EIS is not required for a proposed action, or a positive decision, in which case an EIS is prepared in accordance with NEPA guidelines.

If an EIS is considered necessary, based upon the EA, CEQ guidelines are used to determine the basic structure of the EIS. Because Federal programs vary substantially among agencies, CEQ guidelines require that agencies develop specific procedures, tailoring the EIS process to their particular activities. In the case of waste management, in place of or preceding a facility-specific EIS, a Generic Environmental Impact Statement (GEIS) may be prepared to discuss the impact of a program in which one or more facilities may eventually be involved and where there are

widespread implications that warrant a statement of overall impact. The decision to prepare either an EIS or a GEIS to fulfill NEPA requirements is based upon internal DOE guidelines as published in the Federal Register, July 18, 1979, 44 (139) P42136.

Frequent and continuous coordination is maintained with the DOE Office of Environment (EV) which has responsibility for implementing NEPA guidelines. Proposed revisions to CEQ guidelines for implementing NEPA are under review by NEW.

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II. FY 1981 NUCLEAR WASTE MANAGEMENT OVERVIEW

This Program Summary Document describes the program of the U.S. Department of Energy (DOE) Office of Nuclear Waste Management (NEW) for Fiscal Year (FY) 1981. The budget and the program which this document supports are designed to address the technical, social/institutional, economic, environmental, and political issues in waste management and transportation which have been evolving in the period preceding FY 1981 budget preparation. A major influence on the program was the Report to the President by the Interagency Review Group (IRG) on Nuclear Waste Management. The comprehensive analysis of the waste management problem made by the IRG, coupled with its conclusions and recommendations, helped mold the DOE programs into their present form. DOE has since taken the initiative and greatly expanded the waste management programs, increasing their scope and depth while actively pursuing public and State involvement in the decisionmaking process. The following subsections briefly describe how the IRG recommendations were implemented by DOE as reflected by the FY 1981 waste management program detailed in this document. The major strategy and policy options identified by the IRG are then summarized.

Interagency Review Group Report on Nuclear Waste Management

In his April 1977 presentation of the National Energy Plan (NEP) to Congress, President Carter directed that a review of the entire waste management program be undertaken. An IRG was established to accomplish this comprehensive program review. IRG completed this review with publication of the Report to the President by the IRG on Nuclear Waste Management in March 1979. Presidential action on IRG recommendations has recently been completed with the establishment of a comprehensive radioactive waste management program (Appendix A). The DOE program for FY 1981 is consistent with the President's Statement.

The IRG report summarizes what is known about each of the primary disposal options, identifies and analyzes alternative policies for guiding radioactive waste management, and makes important recommendations on the nature of the research and development (R&D) plans underlying the waste management strategy. The IRG recommendations also suggest the next steps for further understanding and appreciation of radioactive waste management problems.

DOE/NEW has been a primary participant in the development of the IRG report. NEW has begun to implement IRG recommendations within budgetary and technical constraints. In areas where final decisions are still pending (such as the number of geologic media and alternative sites which should be qualified prior to

the development of the first repository), implementation awaits Presidential and congressional review. The budget and program will be amended as policy becomes further defined. Such evolution is expected to result from continuing interaction among Federal agencies, Congress, State and local governments, public and private interest groups, and the general public.

A. NUCLEAR WASTE MANAGEMENT STRATEGY

The achievement of the Government's overall objective of providing safe management of nuclear wastes requires a broad-based strategy that includes careful attention both to the operation of existing waste storage and disposal facilities and to long-term plans for interim storage and disposal of wastes. In the early decades of the Atomic Energy Commission's (AEC's) nuclear program, waste management strategy was dominated by concern for production of weapons materials, development and operation of research and test reactors, and development of naval propulsion systems.

Beginning in the late 1950's, waste management strategy turned from short-term solutions to an increasing emphasis on the development of waste disposal methods which would provide isolation from the biosphere for very long time periods with minimum requirements for maintenance and surveillance by man. At the same time, commercialization of nuclear technology began to take place as radioisotopes were used in medicine and industry and nuclear power plants were constructed for generation of electricity. Thus, the non-Government sector began to produce nuclear waste in increasing quantities.

Increasing emphasis on long-term environmental issues and the expanding use of nuclear power for electricity generation have resulted in a greater emphasis on seeking permanent disposal of radioactive wastes. A wide group of scientists have now begun to contribute to the waste management program so that issues are being addressed on a broad front. The Government's waste management strategy is continuing to evolve, and major new initiatives are under consideration. In particular, the recommendations of the DOE task force on waste management and the IRG draft report on nuclear waste management contain specific recommendations for changes in the current program.

The following discussion of waste management strategy considers:

- All Government-generated nuclear waste (often referred to as "defense waste," although some small amounts of it result from nondefense Government R&D activities)
- Civilian high-level waste (HLW)

In accordance with recent Presidential direction and congressional authorization, the following additional types of

nuclear material have been incorporated into DOE's program considerations:

- Civilian spent fuel
- Civilian low-level waste (LLW) and other waste

1.0 BACKGROUND

The Government has been faced with handling radioactive wastes since the days of the Manhattan Project. Three principal methods were used and are still in use today: (1) shallow land burial of LLW, (2) storage of high-level liquid wastes and sludges in shielded subsurface tanks, and (3) storage of spent fuel and other materials in shielded water basins.

A limited amount of waste has also been stored in vaults and on surface pads, disposed of in deep ocean, held in settling ponds, and disposed of as grout in deep shale formations by shale fracturing.

1.1 High-Level Waste

HLW is a product of reactor fuel reprocessing and occurs in the form of an acid aqueous waste stream when plutonium and uranium are separated from the spent fuel. Almost all of the present HLW has resulted from processing military reactor fuels. At the Hanford Reservation and Savannah River (SR) sites, the alkaline liquid HLW is held as liquids and solids in large subsurface tanks surrounded by concrete. At DOE's Idaho reservation, acidic liquid waste is first stored in stainless steel tanks, converted to a solid by calcining, and then stored retrievably in stainless steel bins inside concrete vaults.

In the past decade, considerable effort has been devoted to improving the safety of the HLW handling and storage systems. Some of the measures have included evaporation of excess water to produce a solid salt cake in the tank, provision of new double-walled tanks, improved instrumentation for leak detection, and removal of strontium and cesium at Hanford to reduce heat production. Leaks have occurred in some of the older tanks releasing radioactivity to the surrounding earth. These leaks have not resulted in any measurable release of radioactivity to underground aquifers or in any injury to health, but they have caused concern about the use of the tanks for long-term storage.

In the late 1950's, work began on developing the technology for permanent disposal of HLW. The AEC focused its efforts on processes for solidification and immobilization of the liquid wastes (by calcining and vitrification) and on isolation of the solidified waste canisters in deep, stable geologic formations. Salt formations were identified as being most promising. In the mid-1960's, Oak Ridge National Laboratory (ORNL) carried out an experimental program in the Lyons, Kansas, area to develop the

technology for disposal in bedded salt. The program was generally successful in accomplishing its technical objectives.

In 1971, the AEC asked Congress to authorize construction of a repository for disposal of commercial HLW and defense transuranic (TRU) waste, with Lyons as a tentative site, subject to the satisfactory completion of certain additional tests and studies. Congress authorized only additional studies. In view of political opposition and the recognition that two site-specific safety questions might not be resolved in a reasonable period of time, AEC abandoned work at Lyons in mid-1972 and began evaluation of possible replacement sites. To maintain the existing regulatory limit on the amount of time a generator may retain custody of solidified HLW (5 years), AEC simultaneously began a program for Retrievable Surface Storage Facilities (RSSF's).

In 1974, a parallel program was initiated at Sandia Laboratories (SL) to develop a Waste Isolation Pilot Plant (WIPP) at a bedded salt site in New Mexico. Congress authorized the WIPP facility to receive TRU waste generated by the defense program and to provide an experimental test capability for HLW.

Shortly after the formation of the Energy Research and Development Administration (ERDA) and its assumption of responsibility for nuclear technology development in 1975, ERDA management reevaluated the waste management program. The ERDA analysis indicated that, due to delays in the buildup of commercial nuclear power and fuel reprocessing, geologic waste isolation could be available in time to satisfy the Nation's needs and an RSSF would probably not be required.

New emphasis was given to the geologic program with the formation of the Office of Waste Isolation (OWI) at Union Carbide Nuclear Division in Oak Ridge. OWI was assigned the task of performing extensive geologic exploration to identify potential repository sites in salt and to investigate igneous and argillaceous rock formations as possible disposal media. This work included extensive geologic exploration at the Hanford Reservation to evaluate the potential of the area's basalt formations and at the Nevada Test Site (NTS) to assess the local geologic formations. The broad-based OWI effort included conceptual repository design studies, equipment development, waste migration studies, and detailed planning for licensing, construction, and operation of a repository as well as a transportation program plan to support the OWI program. In 1977, the activities at Hanford and NTS were separated from OWI as specific site evaluation projects. In July 1978, the OWI program was transferred to the Office of Nuclear Waste Isolation (ONWI) at Battelle Memorial Institute, with essentially the same objectives.

In 1977, when the Government announced its decision to defer civilian fuel reprocessing indefinitely, the HLW disposal program

was expanded to consider disposal of spent fuel in geologic repositories. Subsequently, the Government proposed a new spent fuel policy which extended its previous obligation to accept commercial HLW for disposal to spent fuel as well. Under the spent fuel policy, the Government will offer to accept and take title to spent fuel for a one-time charge which will cover all the Government's costs for storage and disposal. Since it is expected that spent fuel receipts by the Government will begin before the availability of a geologic repository, a program has been initiated to provide temporary away-from-reactor (AFR) fuel storage in water basins. Recognizing that transportation is an essential support function and that efforts needed to be focused, NEW established a Transportation Technology Center during FY 1979.

1.2 Low-Level Waste

Significant quantities of LLW began to be generated when the Government initiated reactor operations in support of the weapons program in the 1940's. At most of the major sites, land was set aside for disposal of this waste by shallow land burial. The techniques have changed little with time. Solid waste is placed in relatively shallow trenches which are filled to about one meter from the surface and then backfilled with the excavated material.

Until the early 1960's, AEC accepted the relatively small amount of commercially generated LLW at two of its burial sites (Oak Ridge and Idaho). In 1962, the first commercially operated burial ground was opened (Beatty, Nevada). Subsequently, a total of six commercial sites went into operation around the country.

These commercial burial sites are State-owned with the exception of the Richland (RL) site (Hanford Reservation), which is leased to the State of Washington by the Federal Government. Five of the burial ground operations were licensed by the States under the "agreement state" provisions of the Atomic Energy Act; the sixth, the Illinois burial ground, was under direct Nuclear Regulatory Commission (NRC) regulation.

In the past several years, problems with commercial burial ground operations at a number of sites have emerged. Only one (Barnwell) of the four eastern sites remains in operation. The two western sites at Beatty, Nevada, and Richland, Washington, were temporarily closed recently because of a lack of proper enforcement of safety standards in the transportation and packaging of the wastes. The sites were reopened after DOT and NRC gave assurances to the States relative to enforcement of packaging and transportation standards.

DOE operates burial grounds at 14 Government-owned sites for the Government's waste. These sites are under internal DOE regulation. A portion of the DOE wastes contains significant

concentrations of long-lived TRU isotopes. In 1970, the Government decided that these TRU wastes should no longer be disposed of through shallow land burial. The planned final disposal of TRU wastes is in a deep geologic repository. Until a repository is available, these wastes are being stored near the surface.

2.0 RATIONALE FOR CURRENT PROGRAM PRIORITIES

Program management for nuclear waste has been segmented into commercial nuclear waste, defense nuclear waste, and spent nuclear fuel.

In many R&D areas, commercial and defense nuclear waste programs deal with similar waste forms and handling technologies. Therefore, the two activities are planned and managed jointly to complement each other and to avoid duplication of effort. R&D is funded with commercial or defense budgets depending upon where the first or most widespread application may occur. Applied work, such as adaptation of equipment and processes to existing wastes, is funded by the program that will use the technology.

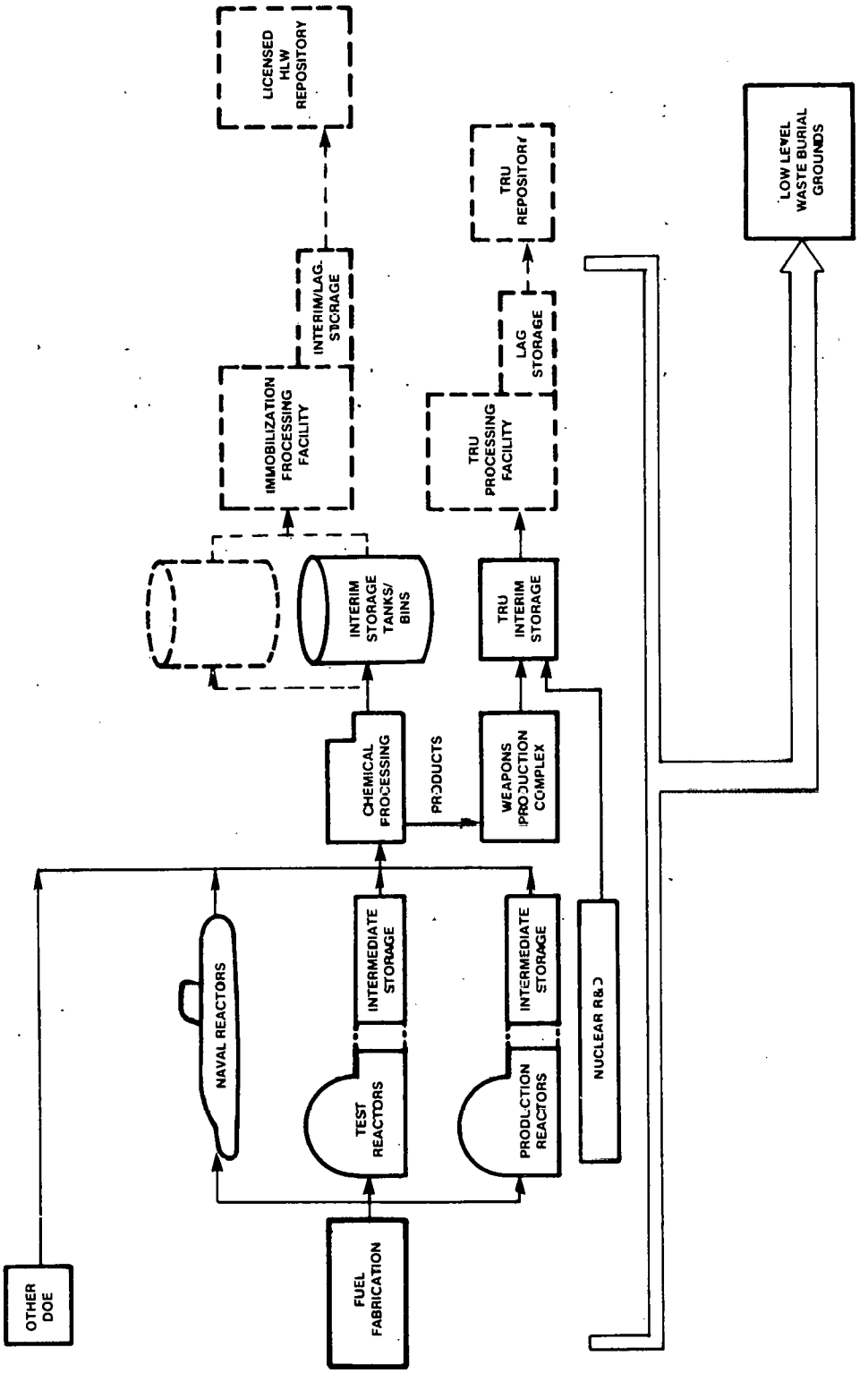
2.1 Defense Nuclear Waste

Radioactive wastes have been generated as a byproduct of the national defense programs to produce and use nuclear materials in weapons and other national defense applications over the past 35 years. The principal source of radioactive waste is the reprocessing of fuels irradiated in nuclear reactors to recover plutonium, uranium, and other products. Other major sources of wastes are the manufacturing operations to produce plutonium components for weapons, laboratory operations, and reactor operations as shown in the following figure.

Activities in the Defense Nuclear Waste Program are designed to confine radioactive wastes so that safety, environmental, and public health standards are met and maintained. In the near term, confinement of radioactive waste is accomplished in a way that is compatible with potential long-term management practices. The long-term objective is to provide the required confinement of radioactive wastes (1) with minimum reliance on future maintenance and surveillance by man, and (2) in a way that ensures a high degree of isolation from man's environment during the period that waste will present a potential radiation hazard.

The Defense Nuclear Waste Activity consists of five primary subactivities:

- Decontamination and Decommissioning (D&D)
- Interim Waste Operations
- Long-Term Waste Management Technology



The Generation of Radioactive Waste from Defense Programs

- Terminal Storage
- Transportation R&D

DOE/NEW recognizes that the information developed through the Defense Nuclear Waste Activity may be applicable to achieving commercial waste management objectives. The commercial and defense programs are therefore managed jointly by the same organizational units.

2.1.1 Decontamination and Decommissioning

A systematic program of D&D projects for Assistant Secretary for Nuclear Energy (ASNE) radioactive facilities will be developed and pursued as such facilities are declared excess. R&D will be conducted where required to support specific projects. The Surplus Facilities Management Program (SFMP) addressed in the Remedial Action Program is responsible throughout ASNE for all of the functions discussed above. The Defense waste management D&D tasks are managed within the SFMP to ensure maximum information exchange for those tasks which are similar to commercial waste management D&D tasks. The single manager concept for these D&D functions also decreases cost.

The Defense D&D tasks will be on facilities at ORNL, Idaho National Engineering Laboratory (INEL), and the Mound Facility, Miamisburg, Ohio. The objective of these D&D tasks is to conduct sufficient D&D operations where no further maintenance and surveillance of the facility are required because of radiological safety considerations.

2.1.2 Interim Waste Operations

The strategy of the Interim Waste Operations subactivity is to continue to provide safe handling and storage of DOE radioactive wastes pending implementation of the long-term waste management programs. A continuing improvement program for the confinement of existing and currently generated waste products will be maintained. Treatment and storage facilities will be compatible with alternatives or improvements under consideration for the long-term management of those wastes.

The design of improved facilities for HLW is based on the philosophy of multiple containment to minimize both the potential for release of radioactive material and the consequences of possible accidents.

Low-level solid waste will continue to be disposed of by shallow land burial. Upgrading of shallow land burial practices for LLW will focus on implementation of improved technology, making operations subject to comprehensive criteria, and stabilization of sites that are no longer needed. Upgraded requirements and related criteria will be developed through assessment studies. Reductions in waste generation will be encouraged. Alternatives to shallow land burial will be developed to help manage potential increases in waste generation from D&D and other activities. Intermediate-level liquid wastes generated at ORNL will continue to be disposed of by shale fracture.

TRU-contaminated solid wastes will continue to be stored retrievably, pending availability of any required treatment facilities and a final disposal mode (repository).

2.1.3 Long-Term Waste Management Technology

This subactivity covers R&D on the following categories of waste:

- HLW
- TRU waste
- LLW
- Airborne waste

Specific long-term management solutions for treatment and disposal of HLW will be implemented on a site-by-site basis to satisfy site-specific requirements and minimize the economic impacts. Savannah River will be the first site, followed by Richland and Idaho. An early demonstration may be made through immobilization, packaging, and emplacement of defense HLW at a suitable repository if appropriate opportunity exists. To prepare radioactive wastes for disposal, waste treatment and handling technology will be developed, and facilities constructed, based on health, safety, environmental, and economic considerations. Requirements will be based on current and expected regulatory criteria, standards, and restrictions on releases.

2.1.4 Terminal Storage

The strategy was, and Congress authorized, the design, construction, and operation of a research and development facility--the WIPP--for defense waste. The WIPP was proposed to be a geologic repository located in a deep-bedded salt formation near Carlsbad, New Mexico, and used for the permanent isolation of defense TRU waste and for conducting experiments with various forms of HLW. Although the WIPP facility project has been canceled, the designated WIPP site will be reserved for consideration as a potential future repository for commercial and defense wastes. Geologic studies and exploration, testing and technical, economic, and environmental evaluations will be continued as appropriate to meet technical and institutional requirements necessary for site qualification.

2.1.5 Transportation Research and Development

A systematic approach is being used to ensure that transportation systems are available to meet operational requirements for DOE intersite transportation of radioactive wastes. Technology will be developed and implemented; facilities and transportation systems will be designed, fabricated, and tested. These activities will continue to involve industry, DOE laboratories, and universities.

The objective of the Transportation Research and Development subactivity is to develop a national capability to cope with the growing complexities of transporting nuclear materials. Safe, reliable, publicly acceptable, and cost-effective systems must be made available on a schedule that is consistent with the transportation needs of the defense waste and other national programs. A systems approach which addresses technological, institutional, and operational problems has been implemented through the Transportation Technology Center at Sandia Labs (SL), New Mexico. This approach will ensure that transportation hardware is available. Previous and existing transportation activities are being reviewed to preclude redundant activities.

The Transportation Technology Center and the Albuquerque Operations Office (AL) will seek to integrate efforts so that the cost of developing and implementing transportation systems is minimized. The Transportation Technology Center has formulated a plan for meeting the needs of defense waste management activities. This plan will result in the design and testing of systems with risk analysis and institutional issues included in the systems approach.

2.2 Commercial Nuclear Waste

This activity will provide long-term management for commercial radioactive waste and its final long-term isolation from the environment. Nuclear power stations create most of the commercial radioactive waste, but other sources include R&D, medicine, and industry.

There are a number of technical alternatives for long-term management. The process for selecting one of these is nearing completion with the issuance of a draft programmatic Environmental Impact Statement (EIS) for public review. The most developed and most likely alternative for long-term isolation of HLW from the biosphere is through appropriate treatment of the wastes (solidification and packaging to immobilize them) followed by their emplacement into repositories engineered into deep geologic formations. The sites for these repositories would be carefully selected according to whether they provide stable natural barriers to migration of radionuclides toward the biosphere, thereby ensuring public health and safety over the long term.

The Commercial Nuclear Waste Activity is composed of three subactivities:

- Terminal Isolation R&D
- Waste Systems Evaluation and Public Interaction
- Waste Treatment Technology

All commercial waste management activities will maintain close coordination with relevant defense waste activities to allow effective technology transfer between the two programs. Close coordination and frequent communication will be maintained with appropriate Federal, State, and local public agencies and officials to ensure public acceptance of the program.

2.2.1 Terminal Isolation Research and Development

Sites for the terminal storage of commercial HLW, spent fuel, and TRU waste are being sought in different regions of the country. Specific sites will be identified that can be demonstrated as having the characteristics appropriate for terminal isolation; several of these sites will become the basis for license applications to the NRC for future regional repositories.

Site investigations and field work, which up to now have focused on promising salt formations under land not owned by DOE, basalt formations at DOE's Hanford site in Washington, and tuff, granite, and shale formations at the DOE NTS, are being expanded to include additional promising geohydrologic systems throughout the Nation.

Near and long term safety evaluation will continue to receive attention during the analysis of sites. A complete evaluation of expected performance at each site will be made.

The terminal isolation program will include studies of geologic formations in several States in different parts of the country, in situ testing with electrical heaters and packaged radioactive materials, and continuing design optimization studies for repository facilities in various geologies.

Assessment of the technical feasibility of seabed disposal as an alternative to land-based disposal was continued with international cooperation from Canada, France, Japan, and the United Kingdom.

2.2.2 Waste Systems Evaluation and Public Interaction

Information and data evaluations in the areas of health and safety, economics, risk assessments, quality assurance, and EIS's will be developed and reviewed to support the waste management program. Evaluations have been prepared on alternative systems for treatment and disposal of radioactive waste from the conventional light water reactor (LWR) fuel cycle and from other fuel cycles identified as having nonproliferation potential. A program has been established to keep abreast of all international waste management programs.

State and local governments actively participate in both the planning and implementation of the site qualification and selection program for a commercial waste repository. Also included in this subactivity is interface with the proposed State Planning Council (to be organized in FY 1980) as well as provision of overview funding to States, the latter allowing independent assessments of the Federal program. A Public Information Plan has been approved which provides for the generation and dissemination of factual information on waste management.

2.2.3 Waste Treatment Technology

This subactivity develops and demonstrates waste handling and treatment technology, including processed waste forms, that meets waste disposal criteria for all categories of waste. Preliminary design specifications will be developed for processes needed to treat each waste type and confirmed in radioactive pilot plant demonstrations when appropriate.

Investigations for HLW involve immobilization processes and waste forms, including alternatives to glass such as cermet, special concrete, synthetic minerals, ceramics, and metal matrix materials. For LLW, the technology development activities include the concentration of waste radionuclides, immobilization of effluent waste concentrations, and packaging and storage. TRU-contaminated waste treatment methods include incineration and immobilization. Activities in airborne waste encompass monitoring, concentration, collection, immobilization, and packaging and storing.

The technology developed and demonstrated to handle defense-related wastes helps to establish methods for commercial waste handling and processing and vice versa. Close coordination with the defense waste programs is carried out to ensure prompt and effective technology transfer and to avoid duplication of effort.

2.3 Remedial Action Program

The objectives of this activity are to keep radioactively contaminated sites and facilities that are no longer required for use in the national nuclear programs from becoming potential health and environmental hazards and to release property for alternative productive use without restrictions. Among several major efforts in this area are:

- Manhattan Engineer District (MED)/AEC Sites Formally Utilized Sites Remedial Action Program (FUSRAP)
- Grand Junction
- Uranium Mill Tailings
- D&D of Surplus DOE Facilities
- West Valley

This activity includes certain privately owned contaminated facilities which were directly involved in the national nuclear programs and for which the Federal Government has determined it has responsibility for remedial action.

2.3.1 Manhattan Engineer District/Atomic Energy Commission Sites

The objectives of this subactivity are to decontaminate and release for unrestricted use properties formerly used for MED/AEC operations. These properties were previously released and have been found to be contaminated based on the guidelines and instrumentation available today. Work will be completed on the first site in FY 1980 and the efforts on a second site will be in progress.

2.3.2 Grand Junction

The objective of this subactivity is to perform the remedial actions authorized under Title II of Public Laws 92-314 and 95-236. This will entail removal of mill tailings from contaminated properties in the area of Grand Junction, Colorado, and the provision of financial assistance to the State in accordance with agreements between DOE and Colorado.

2.3.3 Uranium Mill Tailings

The objective of this subactivity is to stabilize uranium mill tailings at 22 sites as required by Public Law 95-604 within 7 years of the promulgation of Environmental Protection Agency (EPA) standards.

2.3.4 Decontamination and Decommissioning of Surplus DOE Facilities

The objective of this subactivity is to provide surveillance and maintenance of DOE-owned facilities, designated as surplus and to develop and improve techniques for D&D of radioactive facilities, equipment, materials, and land. This subactivity also includes developing plans, priorities, cost, and schedules for the disposition of projects. The management of this subactivity and the Defense D&D subactivity is conducted under SFMP.

2.3.5 West Valley

The objective of this subactivity is to develop the technology and prepare an implementation plan for remedial actions demonstration at Nuclear Fuel Service, West Valley, New York, including the completion of a study on future options for the West Valley Center.

2.4 Spent Nuclear Fuel

To provide an interim solution to the continuing accumulation of spent fuel from nuclear power plants, the Spent Fuel Storage Activity will:

- Ensure that storage space is available for spent fuel so that operation of nuclear power plants within the United States can be continued
- Establish storage and disposal fees associated with the acceptance of commercial nuclear spent fuel
- Support nonproliferation initiatives by offering a credible alternative to nuclear fuel reprocessing by foreign nations

The Spent Fuel Storage Activity consists of the Domestic Spent Fuel Storage subactivity and the International Spent Fuel Storage subactivity.

2.4.1 Domestic Spent Fuel Storage

This subactivity will:

- Plan and manage a program which provides interim spent fuel storage capacity until geologic storage or reprocessing is available
- Establish charge and contract requirements for DOE to provide storage and disposal services
- Identify and resolve safety and environmental issues associated with spent fuel storage
- Develop technology to increase the capacity of existing spent fuel facilities so that advanced, improved high-capacity storage technologies can be developed

2.4.2 International Spent Fuel Storage

This subactivity will:

- Develop the capability to accept limited amounts of foreign spent fuel to meet nonproliferation objectives subject to necessary legislation and approve a required plan for foreign fuel storage in the United States
- Provide technical support to international bodies and limited direct assistance to individual countries to establish spent fuel storage as a credible alternative to reprocessing

- Establish and maintain a current assessment of foreign spent fuel storage needs, capabilities, and plans, and develop and maintain a logistics plan for transferring fuel to the United States

- Augment, as appropriate, domestic spent fuel technology and demonstration and Transportation Technology Center activities to support the unique requirements of international or foreign transportation and storage

Many of the aspects of the Spent Fuel Storage Activity are applicable to both domestic and international fuel disposal activities. These activities include the establishment of storage charges, enactment of necessary legislation, selection and acquisition of storage facilities, and establishment of supporting transportation services.

3.0 STRATEGIC PLANNING AND ALTERNATIVE SCENARIOS FOR NUCLEAR WASTE

3.1 Introduction

The basic strategies and present program priorities for nuclear waste management outlined in the previous section continue to evolve. Within DOE, other interested agencies, and at the interagency level, the existing strategies and plans are under intensive review. Specific conclusions and recommendations with significant impact on the present program are beginning to emerge. One major conclusion has been that the waste management program should be broadened in scope, more emphasis should be placed on a systems approach to program planning and technical decisionmaking, and supporting R&D programs should be expanded to allow management and technical decisions on a broader technical base.

3.2 Interagency Review Group

The IRG on Nuclear Waste Management was formed at the President's direction in March 1978. In October 1978, a draft of the IRG's tentative conclusions and deliberations was released for public review and comment. In the final IRG report published in March 1979, the IRG responded to and incorporated many of the comments received. The extensive documentation published by the IRG, along with the public's comments, has been a major element in DOE's strategic planning effort. A definitive interim waste disposal program strategy has been selected by the President (Appendix A). DOE programs in FY 1981 incorporate all of the technical elements of the President's program.

3.3 Alternative Technical Strategies

The IRG on Nuclear Waste Management examined a number of alternative technical strategies whose environmental impact were described by the analyses in the IRG's report. For illustrative purposes, four technical strategies were defined by the IRG for consideration in planning for disposal of the HLW.

The IRG report was reviewed at the Presidential level with particular attention given to the IRG strategy discussions and recommendations. As a result of this review, the President on February 12, 1980 announced the establishment of a comprehensive waste management program. Briefly, the program includes an interim planning strategy for HLW disposal. Under this strategy, the choice of a site for the first full-scale mined geologic repository should be made about 1985 from 4 to 5 evaluated candidate sites. Operation of the repository should begin by the mid 1990's. Additional details of the program can be found in Appendix A which is a reproduction of applicable sections of the program fact sheet.

4.0 NEED FOR THE NUCLEAR WASTE MANAGEMENT RESEARCH AND DEVELOPMENT PROGRAM

DOE's Waste Management Program has two fundamental responsibilities: the safe management of existing radioactive wastes and the development of technology and facilities for long-term management of present and future wastes. The R&D activities described in this document are intended to satisfy the latter responsibility.

The DOE HLW management program is structured to analyze the entire system consisting of the waste form, the repository, and the environment of the repository. The IRG report states:

> Successful isolation of radioactive wastes from the biosphere appears feasible for periods of thousands of years provided that the systems view is utilized rigorously to evaluate the suitability of sites and designs, to minimize the influence of future human activities, and to select a waste form that is compatible with its host rock.

The DOE waste management R&D programs provide the supporting experimental data and analysis required to meet this objective.

The assessment of the appropriateness of multiple natural and engineered barriers, the host rock and its environment, conservative engineering practices, and any particular waste form or container requires detailed site-specific evaluations. Generic geologic studies and/or risk assessments of hypothetical sites, although useful for site selection and methodology development, do not constitute a sufficient basis for some aspects of repository design or for site-suitability determinations. The

natural variability of hydrogeologic, geochemical, and tectonic conditions, as well as the heterogeneity of rock mass properties, precludes the transfer of detailed earth science data from one region to another. Since site-specific investigations are needed to determine the suitability of any particular site, the importance of examining potential sites and their geologic environments cannot be overestimated. The need to gain access to potential sites is urgent to ensure the timely development of the first repository and, subsequently, follow-on repositories as required.

Further studies are planned to examine the possible effects of future human activities on a repository or its hydrogeologic environment, and the means available to the present generation for influencing such effects.

The degree of long-term isolation provided by a repository, viewed as a system, and the effects of changes in repository design, geology, climate, and human activities are evaluated most effectively through mathematical modeling. Although additional work is needed to ensure that all potential release mechanisms are considered, improve modeling of groundwater flow through fractured media, and evaluate or remove other uncertainties, bounding calculations can usually be performed to place reasonable limits on the expected behavior of a repository.

5.0 TRANSPORTATION

While there is not a major budget category assigned to resolution of commercial waste transportation concerns on an overall basis, any transportation activity cuts across and indirectly supports all programs.

The Transportation Technology Center was established to: (1) address the technical, institutional, and operational problems of transporting radioactive materials, (2) ensure that the transportation needs anticipated to satisfy the requirements of DOE facilities are met, (3) support other DOE programs such as the National Waste Terminal Storage (NWTS) Program, the AFR Storage Sites, the Breeder Reactor Program (BRP), international shipments, research activities, and defense-related programs, and (4) comply with IRG recommendations.

The Transportation Technology Center has the following objectives:

- Identify the needed transportation services, determine when they will be required, and take necessary steps to ensure meeting these requirements on schedule
- Integrate DOE transportation activities to deal more effectively with near- and long-term problems

- Establish procedures for planning, reporting, reviewing, and allocating resources
- Establish methods for evaluating transportation costs and benefits
- Establish a Transportation Information Center
- Ensure the incorporation of public health and safety and environmental protection as key program objectives
- Ensure that environmental aspects of transportation systems are properly integrated into the DOE EIS's and Environmental Assessments (EA's) for NEW programs
- Develop and provide cost-effective operational hardware to meet DOE program schedules
- Ensure that the institutional issues are properly addressed, providing a framework for industry to produce and operate the required transportation system

The following management steps have been taken to ensure that the objectives will be met:

- DOE management of this work has been decentralized to the AL Transportation Program Manager who is responsible for carrying out DOE transportation program activities under DOE Headquarters policy guidance.
- The consolidation of DOE transportation activities has been initiated by designating Sandia Laboratories (Albuquerque, New Mexico) as lead laboratory. As lead, SL holds technical management responsibility for the DOE Nuclear Materials Transportation Activity.
- A Transportation Technology Center has been established at SL.

The extent of DOE involvement in satisfying the needs of the commercial sector will depend on several factors. Firm national policies regarding the disposition of nuclear wastes and spent fuel must be established so that reliable estimates of transportation demand can be made and design interfaces assessed. The subsequent response of the commercial sector in making the required transportation system meet this demand will be a measure of the required involvement of DOE.

However, regardless of DOE's involvement in support of the commercial sector, the Department's responsibilities for nuclear materials transportation are unchanged. Therefore, it is essential that DOE continue to pursue a consolidated program to ensure maximum return for dollars spent.

B. PROGRAM STRUCTURE AND BUDGET

NEW programs are divided into three major categories for budgetary consideration:

- Defense Nuclear Waste
- Commercial Nuclear Waste
- Spent Nuclear Fuel

Shown below is the structure of NEW budget elements within these program categories. Together, these programs are designed to meet the general objective of protecting public health and safety and the environment from the potential hazards of radioactivity, regardless of the source of such materials.

DEFENSE NUCLEAR WASTE – DEFENSE WASTE MANAGEMENT

1.0 Decontamination and Decommissioning
2.0 Interim Waste Operations
- 2.1 Hanford Reservation
- 2.2 Idaho National Engineering Laboratory
- 2.3 Oak Ridge National Laboratory
- 2.4 Savannah River Plant
- 2.5 Other Sites
- 2.6 Richland Landlord Responsibilities

3.0 Long-Term Waste Management Technology
- 3.1 Airborne Waste
- 3.2 High-Level Waste
- 3.3 Low-Level Waste
- 3.4 Transuranic Waste

4.0 Terminal Storage
- 4.1 Waste Isolation Pilot Plant Research and Development
- 4.2 Waste Isolation Pilot Plant Facility

5.0 Transportation Research and Development

COMMERCIAL NUCLEAR WASTE – COMMERCIAL WASTE MANAGEMENT

1.0 Terminal Isolation Research and Development
- 1.1 Basalt Waste Isolation Program
- 1.2 Nevada Terminal Waste Isolation Project
- 1.3 Office of Nuclear Waste Isolation
- 1.4 Seabed Disposal

COMMERCIAL NUCLEAR WASTE – COMMERCIAL WASTE MANAGEMENT (CONTINUED)

2.0 Waste Systems Evaluation and Public Interaction
- 2.1 Federal/State Interactions
- 2.2 Supporting Studies

3.0 Waste Treatment Technology
- 3.1 Airborne Waste
- 3.2 High-Level Waste
- 3.3 Low-Level Waste
- 3.4 Transuranic Waste
- 3.5 Battelle Pacific Northwest Laboratory Landlord Responsibilities

COMMERCIAL NUCLEAR WASTE – REMEDIAL ACTION PROGRAM

1.0 Manhattan Engineer District/Atomic Energy Commission Sites
2.0 Grand Junction
3.0 Uranium Mill Tailings
4.0 Decontamination and Decommissioning of Surplus DOE Facilities
5.0 West Valley

SPENT NUCLEAR FUEL

1.0 Domestic Spent Fuel Storage
2.0 International Spent Fuel Storage

NEW Budget Elements

The following tables show the responsibility for each program subactivity, their funding for FY 1979 through FY 1981, and their institutional funding levels only for FY 1981.

Table II-1. Budget Authority for FY 1979-1981

	DOLLARS IN THOUSANDS*			
	ACTUAL FY 1979	ESTIMATE FY 1980	ESTIMATE FY 1981	INCREASE (DECREASE)
DEFENSE NUCLEAR WASTE – DEFENSE WASTE MANAGEMENT				
Decontamination and Decommissioning	$ 805	$2,000	$6,070	$+4,070
Interim Waste Operations				
Hanford Reservation	59,569	59,370	67,990	+8,620
Idaho National Engineering Laboratory	41,254	22,955	42,190	+19,235
Oak Ridge National Laboratory	4,705	9,770	29,500	+19,730
Savannah River Plant	39,315	56,835	60,925	+4,090
Other Sites	2,106	4,685	3,175	−1,510
Richland Landlord Responsibilities	0	4,385	15,427	+11,042
Total Interim Waste Operations	146,949	158,000	219,207	+61,207
Long-Term Waste Management Technology				
Airborne Waste	2,475	4,130	4,300	+170
High-Level Waste	44,405	43,404	68,853	+25,449
Low-Level Waste	4,686	10,645	17,500	+6,855
Transuranic Waste	17,250	25,255	25,040	−215
Total Long-Term Waste Management Technology	68,822	83,434	115,693	+32,259
Terminal Storage	36,319	28,440	0	−28,440
Transportation Research and Development	2,600	5,000	6,975	+1,975
PROGRAM DIRECTION**	1,529	1,522	1,715	+193
TOTAL DEFENSE NUCLEAR WASTE	257,024	278,396	349,660	+71,264
COMMERCIAL NUCLEAR WASTE – COMMERCIAL WASTE MANAGEMENT				
Terminal Isolation Research and Development				
Basalt Waste Isolation Program	34,700	43,150	46,176	+3,026
Nevada Terminal Waste Isolation Project	20,990	17,600	20,080	+2,480
Office of Nuclear Waste Isolation	100,151	91,800	138,119	+46,319
Seabed Disposal	2,800	6,900	9,200	+2,300
Total Terminal Isolation Research and Development	158,641	159,450	213,575	+54,125
Waste Systems Evaluation and Public Interaction	5,301	3,100	7,500	+4,400
Waste Treatment Technology				
Airborne Waste	2,688	1,955	3,100	+1,145
High-Level Waste	14,794	8,919	7,200	− 1,719
Low-Level Waste	1,318	623	4,300	+3,677
Transuranic Waste	3,458	4,303	5,400	+1,097
Battelle Pacific Northwest Laboratory Landlord Responsibilities	2,550	5,700	2,500	− 3,200
Total Waste Treatment Technology	24,808	21,500	22,500	+1,000
PROGRAM DIRECTION**	1,486	1,365	1,762	+397
TOTAL COMMERCIAL WASTE MANAGEMENT	190,236	185,415	245,337	+59,992

*Includes Operating Expenses, Capital Equipment, and Construction
**"Program Direction" covers Headquarters personnel expenses

Table II-1. Budget Authority for FY 1979-1981 (Continued)

	DOLLARS IN THOUSANDS*			
	ACTUAL FY 1979	ESTIMATE FY 1980	ESTIMATE FY 1981	INCREASE (DECREASE)
COMMERCIAL NUCLEAR WASTE – REMEDIAL ACTION PROGRAM				
Manhattan Engineer District/ Atomic Energy Commission Sites	2,810	10,155	14,000	+3,845
Grand Junction	1,500	0	2,000	+2,000
Uranium Mill Tailings	2,940	10,415	13,200	+2,785
Decontamination and Decommissioning of Surplus DOE Facilities	14,730	9,075	19,350	+10,275
West Valley	0	5,000	5,000	0
PROGRAM DIRECTION**	0	0	0	0
TOTAL REMEDIAL ACTION PROGRAM	21,980	34,645	53,550	+18,905
SPENT NUCLEAR FUEL				
Domestic Spent Fuel Storage	8,000	15,000	15,800	+800
International Spent Fuel Storage	3,000	3,000	4,200	+1,200
PROGRAM DIRECTION**	424	482	513	+31
TOTAL SPENT NUCLEAR FUEL	11,424	18,482	20,513	+2,031
TOTAL	480,664	516,938	669,060	+152,192

*Includes Operating Expenses, Capital Equipment, and Construction
**"Program Direction" covers Headquarters personnel expenses

Table II-2. Institutional Funding Levels*

	INSTITUTIONS	PROGRAM AREAS: COMMERCIAL NUCLEAR WASTE	DEFENSE NUCLEAR WASTE	SPENT NUCLEAR FUEL	TOTALS
LABORATORIES	Savannah River Laboratory	0	22,718	0	22,718
	Sandia Laboratories	34,370	7,520	1,900	43,790
	Pacific Northwest Laboratory	8,937	7,365	0	16,302
	Other Laboratories	6,966	26,620	0	33,586
	Total Laboratories	50,273	64,223	1,900	116,396
INDUSTRY	Rockwell Hanford Operations	46,176	102,389	0	148,565
	Savannah River Plant	1,662	70,925	0	72,587
	ENICO	1,756	43,935	0	45,691
	Battelle Columbus	115,119	0	0	115,119
	Rockwell International	882	605	0	1,487
	Other Industries	21,834	35,102	0	56,936
	Total Industries	187,429	252,956	0	440,385
UNIVERSITIES	Universities	7,425	1,815	0	9,240
	Total Universities	7,425	1,815	0	9,240
OTHER		1,762	1,715	513	3,990
UNALLOCATED		51,998	28,951	18,100	99,049
TOTALS		298,887	349,660	20,513	669,060

*Dollars in Thousands

A summary of waste management funding in the categories of operating expenses, capital equipment funds, and construction funds is shown below.

Table II-3. Program Funding Summary

EXPENDITURE CATEGORIES	BUDGET AUTHORITY (DOLLARS IN THOUSANDS)		
	FY 1979	FY 1980	FY 1981
Operating Expenses *	339,711	416,213	555,819
Capital Expenses	19,020	24,925	40,860
Construction	121,933	75,800	72,381
TOTAL	480,664	516,938	669,060

*Includes program direction

C. SIGNIFICANT ISSUES

The DOE Waste Management Program must address the primary radioactive waste management issues. These issues are grouped as follows:

- Technical
- Socioeconomic (including environmental)
- Institutional and political

"Technical issues" are unresolved scientific questions of how natural or manmade materials or systems interact, and how to resolve such scientific questions. "Socioeconomic issues" are unresolved questions about cost (in monetary and social impact terms), who will pay, and the terms for payment or handling the social impact. "Institutional issues" are questions about waste management organization, the political basis for programmatic and regulatory decisions, the relationships among political entities, and the authorities and responsibilities of program participants.

To date, the most comprehensive statement of the issues in waste management is found in the IRG report. The discussion of program strategy (Section A of Chapter II) describes the organization and implementation of NEW programs to resolve the significant issues.

D. MANAGEMENT APPROACH

This section briefly covers the main features of DOE/NEW staff organization and the primary management procedures which govern the NEW program.

NEW programs are decentralized to DOE field offices and executed through their contractors. Policy and overall budget priorities are established by NEW Headquarters, which gives appropriate direction to the field. Headquarters subsequently monitors the field office and contractor activities.

NEW coordinates its Headquarters and field activities with other Federal agencies, State and local governments, industry, universities, and public interest groups as appropriate.

1.0 MANAGEMENT OVERVIEW

The DOE has adopted a comprehensive approach toward energy technology development. Components include the following:

- Two high-level advisory groups (i.e., Energy Systems Acquisition Advisory Board (ESAAB) and the Research Council) to assist the DOE Under Secretary with major technology development decisions
- A Central Review Board established in May 1978 to help identify budget revisions needed to support new initiatives
- A concentrated DOE staff effort to assess project progress and to avoid unnecessary expenditures

Some of these components are described in more detail in the following sections.

1.1 Energy Systems Acquisition Advisory Board

The board, serving as an advisory body to the Under Secretary, provides supporting information and makes recommendations when program or project decisions are necessary.

In addition to the Under Secretary, the board membership includes the Under Secretary's two deputies; the ASNE; the Assistant Secretaries for Resource Applications, Environment, Defense Programs, Policy and Evaluation, and Conservation and Solar Applications; the General Counsel; the Controller; and the Director of the Office of Energy Research. Other Assistant Secretaries can participate in meetings if programs in their areas are to be discussed.

1.2 Research Council

The council, a standing committee chaired by the DOE Director of the Office of Energy Research, provides the Under Secretary with information on all research-related areas.

- Identifies high-priority research areas
- Recommends allocation of DOE resources for research
- Recommends splits between inhouse and contracted research efforts
- Recommends the placement of new research facilities
- Assesses current research efforts
- Helps to shape the annual DOE research budget

1.3 Multiphase Contracts

Contracts are written in four general phases: project definition, design and development, fabrication and construction, and operation/production. These phases allow DOE to manage its contracts efficiently and provide a mechanism to terminate ill-defined or uneconomic projects.

1.4 State-of-the-Art Assessment

DOE program managers are required to prepare periodic reports which detail how well selected programs have met their primary objectives. Problems such as technology gaps and environmental difficulties are also to be identified so that the ESAAB can discuss any changes necessary for the program to proceed.

1.5 DOE Business Strategy

At the earliest practical time in the development of a project, an analysis of the desired approach is prepared in order to commercialize the program, where commercialization is desirable. The analysis includes the following:

- Methods of obtaining and sustaining competition
- Selection of the type of contract or financial assistance best suited to each phase of the project
- Need for developing contractor incentives
- Identification of economic risks and their effects on the program

At present, the unique requirements for Federal Government operation of waste management make this strategy less applicable than to many other DOE R&D programs.

2.0 PROGRAM MANAGEMENT — HEADQUARTERS

DOE had developed and implemented a new formal management system for the allocation of resources and for the development of plans and budgets. Key responsibilities were assigned by Secretary Duncan in his memo of November 13, 1979, entitled "DOE Planning, Programming and Budgeting System". "Program Preparation Instructions for FY 82-86" were issued December 26, 1979, by the Assistant Secretary for Policy and Evaluation. The system is composed of (1) objectives governing the system, (2) major concepts for program framework, (3) basic system elements, (4) system implementation schedules and (5) definitions of key concepts.

Objectives of the management system include:

- Ensure that all major programs are developed with clear operational time-phased objectives (multiyear to relate to budget process)
- Ensure that all significant projects and activities have clear, relevant subobjectives
- Relate program/project and activity objectives to National Energy Act (NEA), NEP, and other plans and legislation, where possible
- Provide for determining priorities among programs and projects, and relate these priorities to various levels of resource availability
- Avoid commitment of major resources prior to adequate project definition
- Provide key program and project managers with a clear view of related program and project objectives and plans
- Provide visibility on all key decisions and timely feedback for all levels of management
- Maintain accountability through all levels of the organization with a minimal amount of procedure and paperwork

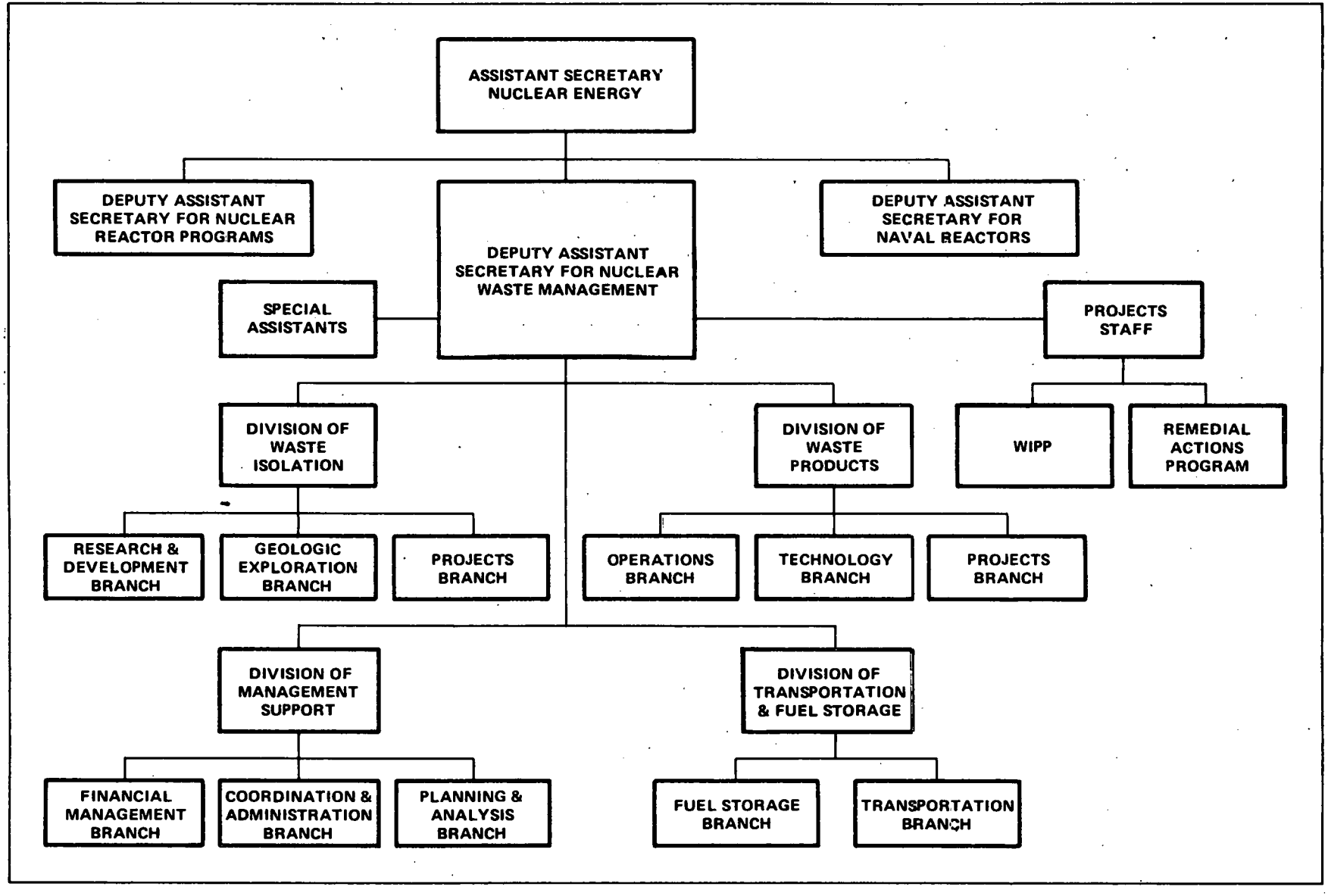
Basic system elements include the following:

- Policy and fiscal guidance
- Program plans

- Energy systems acquisition project plans
- ESAAB
- DOE Research Council
- Financial management
- Procurement and contracts management
- Program/project review and management reporting
- Market Development Planning and Management System
- Laboratory Work Authorization System
- Institutional planning process for DOE laboratories
- Program and project management training
- Review of outlay programs--FY 1980 budget
- Criteria for selecting program/project approval and review
- Basic inventory of ongoing programs/projects, including construction
- Review of technology base

The organization of the NEW is shown in the figure on the following page.

Following the DOE policy of decentralized management, all NEW projects are managed by DOE field offices. Formal management agreements have been or are being established between Headquarters and specific field operations offices. They set the arrangements for execution of projects. They cover purpose, program direction, organization, responsibilities of key officials and participants, and the authorities of the participants. An example is the agreement with the Idaho Operations Office for management of the Airborne Waste Management Program.



NEW Organization Chart

More specifically, the roles and responsibilities at Headquarters and operations offices are as follows:

Office of Nuclear Waste Management (Headquarters)

- Within the policy guidance provided by the ASNE, NEW interprets policies and develops strategic and program plans encompassing scientific and technical activity content, goals, and objectives (including environmental and safety requirements)
- Within ASNE, NEW interacts, as appropriate, with DOE staff organizations and other Federal agencies
- Develops and defines budget requirements and defends budget requests to the Office of Management and Budget (OMB) and congressional committees as appropriate
- Provides general policy guidance and technical direction to field offices and contractor organizations
- Monitors technical and programmatic progress, initiates programmatic reviews, evaluates results, and modifies program direction, as appropriate (includes both research operations and major device fabrication funding activities), within the limits allowed by ASNE

Operations Offices

- Manage projects with full authority in accord with management plan approved by Headquarters
- Provide day-to-day management on projects with periodic feedback to NEW
- Perform contract administration activities and other activities incidental to project management
- Direct contractors in financial and technical matters

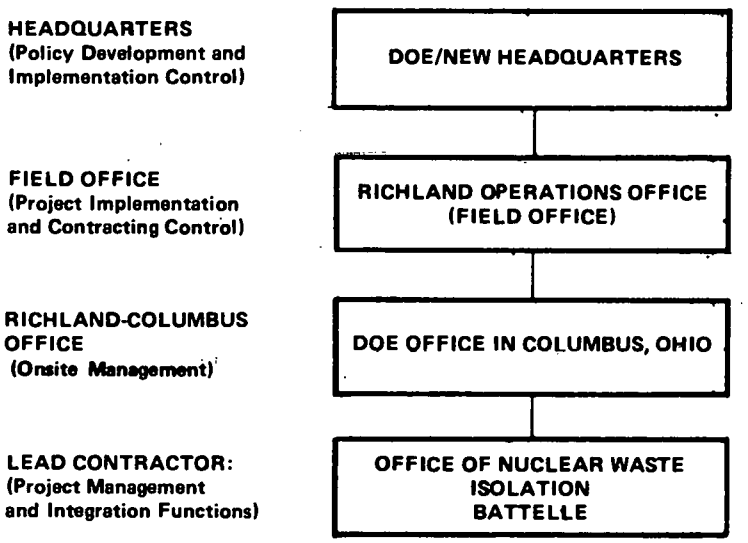
Contractors (National Laboratories, Universities, and Industry)

- Initiate proposals or respond to requests for proposals
- Assist in the development of strategic activity plans
- Execute the technical program within the guidance provided by DOE

3.0 PROJECT MANAGEMENT — FIELD ACTIVITIES

DOE policy is to decentralize its project activities. Field offices and their contractors are responsible for project

execution. In waste management, the analyses, developmental work, operations, and project management are performed by national laboratories and other contractors who report to DOE field operations offices. In addition, decentralization involves assigning major program integration functions to DOE field organizations and their lead contractors. An example of such decentralization drawn from the commercial waste management activity is the program management of the HLW repository development effort. The reporting relationships are shown below.



Example of Reporting Relationships Between Headquarters, Field Offices, and Lead Contractors

Additional detail of the organization and operation of field activities is provided in Chapter IV.

E. PUBLIC PARTICIPATION

The legislation establishing the Department of Energy (DOE) (P.L. 95-91, Title I, Sec. 102) directs DOE to provide for, encourage, and assist the public to participate in the development and execution of National energy programs.

DOE Order 1210.1, Citizen Participation Manual, provides guidance and procedures for program offices in making decisions on, planning, and conducting public participation activities. All offices are directed to observe the guidance and procedures, including the public participation efforts required by DOE Order 2020, Procedures for the Development and Analysis of Regulations, Standards, and Guidelines.

As public concern over waste management has grown public participation has become an integral part of the NEW program. DOE recognizes that the development of an acceptable waste repository, a spent fuel storage activity, and a program to manage existing waste inventories requires direct and frequent interaction with the following parties:

- State and local governments
- Public interest groups (national, State, local community, environmental, consumer, and other representatives)
- Industrial representatives
- Nongovernment scientific experts
- Professional associations
- General public

Opportunities for interaction by these groups include the following:

- Congressional-DOE budget cycle hearings
- NEPA process public forums (e.g., EIS public hearings)
- NRC licensing hearings (for eventual specific waste disposal facilities)
- Formal Reviews by the National Academy of Sciences/National Research Council(NAS/NRC)--Committee on Radioactive Waste Management
- Advisory committees

- Technical meetings on waste management technology (e.g., the meetings sponsored by universities, professional societies, and Government organizations)

- Local public information meetings sponsored by DOE field offices and program participants

Additional mechanisms for public input exist which solicit written comments concerning proposed rules and regulations in addition to published programmatic documents. Further, mechanisms are being developed to provide direct dialogue between DOE and concerns at the local level.

1.0 NEED TO IMPROVE PUBLIC PARTICIPATION

The March 1979 IRG report to the President states the following:

> . . .the resolution of institutional issues, required to permit the orderly development and effective implementation of a nuclear waste management program is equally important as the resolution of outstanding technical issues and problems and would add that the resolution of institutional issues may well be more difficult than finding solutions to remaining technical problems.

The public participation program has been greatly expanded over the past year and will continue to expand during FY 1981. The next section describes current DOE/NEW programs as well as new activities suggested in recent reviews of the Nuclear Waste Management Program.

2.0 CURRENT MECHANISMS FOR PUBLIC PARTICIPATION IN THE DOE NUCLEAR WASTE MANAGEMENT PROGRAM

Several mechanisms for public review of the DOE Nuclear Waste Management Program exist under current legislation and governmental operating practices. These are described below.

2.1 Congressional Hearings

Congress annually reviews the DOE Nuclear Waste Management budget and periodically holds oversight hearings on this program. Public testimony on this process can result in redirection and reemphasis of DOE programs by Congress.

2.2 Federal and State Regulatory Processes

Many projects included in the Nuclear Waste Management Program are subject to review by other agencies. The NRC will be required to license most waste disposal facilities. The EPA will set the applicable general environmental standards required for these facilities. Both of these actions require that proposed

rules, regulations, and standards be published for public scrutiny and comment prior to final issuance. State and local agencies may also review certain aspects of facilities proposed within that State. All of these regulatory organizations and agencies may offer opportunities for participation on issues relevant to nuclear waste management.

2.3 National Environmental Policy Act Process

The NEPA process provides for direct public review of major projects of the sponsoring agency. This is done in public review of EIS's and other documents which must be prepared to support DOE decisionmaking in waste management. This type of review remains a principal mechanism for public input on major projects proposed in this program.

2.4 DOE Sponsored Public Hearings and Direct Communication with the DOE Program

In 1976, as part of the NWTS Program, ERDA originally initiated direct contact with 36 States in areas where potential waste disposal sites were being considered. Open cooperation on site selection criteria and procedures was offered to these States, and subsequently information developed by ERDA and later by DOE was made available to the States. Contractor-developed information on geological characteristics and surface characteristics of the study areas is shared with the States, so that the data base upon which decisions will be made is common knowledge. Project-specific public meetings have been held with regard to the proposed WIPP facility in New Mexico, the future of the West Valley facility in New York, and site exploration activities in several regions.

3.0 FUTURE EXPANSION FOR DOE PUBLIC PARTICIPATION PROGRAMS

3.1 State Planning Council

The President has created, by Executive Order No. 12192, dated February 12, 1980, a State Planning Council to advise the Executive Branch and work with the Congress in making and implementing decisions on waste management and disposal, such as planning and siting, construction, and operation of facilities.

The Council is chaired by Governor Richard Riley of South Carolina and includes the following members: eight governors; five State and local government officials other than governors; and a tribal government representative. The Secretaries of Energy, Interior, and Transportation and the Administrator of the Environmental Protection Agency are also members.

The functions and responsibilities of the State Planning Council would not involve implementation responsibilities and would include the following:

- Provide State perspectives for the development of the National Nuclear Waste Management Plan, the site characterization program and other waste activity planning, and other planning documents to ensure that they adequately address the needs of the States and localities.

- Prepare an annual report on its activities to include its recommendations concerning the Government's nuclear waste disposal programs.

- Advise on the regional distrification, characterization, and placement of facilities for the management and disposal of nuclear wastes and review and make recommendations regarding the process for selecting, characterizing, and determining the suitability of potential repository sites.

- Assist DOE and the States in recommending proposed sites for licensing by NRC to assure that the needs of the States and localities are met.

- Establish under its auspices such advisory committees as are deemed necessary to assist in its deliberations. Such committees should include representatives of all relevant interest groups.

- Define additional State roles in the Federal Government's waste management program including State organizational and other institutional questions.

DOE has previously followed a policy of extensive interaction with State and local representatives. The purpose of this policy has been to establish communication between the Federal Government and State and local representatives on the issues and concerns raised about waste management activities and plans. The State Planning Council will greatly assist the planning of DOE°s waste management activities.

3.2 Public Participation

The March 1979 report by IRG states the following:

> In addition to their interaction with State and local government entities (sic), the Federal agencies responsible for developing a nuclear waste management plan and program need to interact with the public. The IRG's own experience with public participation and the recommendations of many citizens appearing before the IRG indicate the urgent need for sustained, effective efforts to inform the public and to provide opportunities for discussion between the public and the government.
>
> To generate a spirit of openness on the part of the Government and of full participation on the part of the public, IRG recommends that, at a minimum, the President encourage, direct, and/or coordinate a program to:
>
> - Routinely update the status of scientific and technical knowledge on nuclear waste management and provide this information to the public at large in understandable terms
> - Increase interaction and discussions between Federal program managers and nationally or locally based institutions and organizations desiring such interaction and discussion
> - Support private sector efforts to generate a greater degree of social and technical understanding and agreement on nuclear waste management issues

Previously and since publication of the IRG report, the DOE Nuclear Waste Management program has organized State-level public conferences to discuss the progress of national waste management activities as well as the local impacts of potential waste activities. Travel allowances provided by DOE for community leaders to attend State conferences ensure early objective attention to all the problems. Brochures have been prepared describing progress in R&D projects. Every mechanism to enhance public participation is being explored to promote the maximum interchange of knowledge on nuclear waste management.

III. ACTIVITY DESCRIPTIONS

This section identifies discrete activities associated with budgetary program elements appearing in the Budget and Reporting Structure of the waste management portion of the U.S. Department of Energy (DOE) budget. Contents for each activity include: associated budgetary category or subcategory, brief description of the activity, a pictorial relevant to the subject, its status and, if appropriate, a chart identifying milestones and funding.

In this Program Summary Document, radioactive wastes are classified as high-level waste (HLW), low-level waste (LLW), transuranic (TRU)-contaminated waste, and airborne waste.

- HLW includes both spent nuclear fuel and waste resulting from the first chemical extraction cycle during fuel reprocessing. Untreated reprocessing waste is a liquid that contains practically all of the irradiated fuel fission products, the small fraction of uranium and plutonium that is not recovered, and the bulk of the other TRU elements in the irradiated fuel.

- Typical low-level solid waste consists of discarded contaminated equipment, filters from the cleanup of gaseous wastes, ion-exchange resins from the cleanup of liquid wastes, liquid waste converted to solid form by incorporation in concrete, and miscellaneous contaminated trash such as paper, rags, glassware, and protective clothing. Some intermediate-level liquid wastes, generated at Oak Ridge National Laboratory (ORNL), are disposed of in deep shale formations.

- Other nongaseous radioactive wastes are classified in this summary document as TRU wastes if significantly contaminated with TRU elements. Liquid TRU is either converted to solids, decontaminated and released under controlled conditions, or concentrated and managed as HLW.

- Airborne wastes are removed from their gaseous carrier by such techniques as filtration and scrubbing, and are then immobilized, stored, or released under controlled conditions.

Budgetary classifications for waste management activities are structured under the following major program elements:

- Defense Nuclear Waste
- Commercial Nuclear Waste
- Spent Nuclear Fuel

A. DEFENSE NUCLEAR WASTE — DEFENSE WASTE MANAGEMENT

Since 1944, radioactive wastes have been generated as a byproduct of the national defense programs that utilize nuclear materials in weapons and other national defense applications. The principal source of radioactive waste has been the reprocessing of fuels irradiated in nuclear production reactors to recover plutonium, uranium, and other useful products. During the processing, over 99 percent of the fission products are accumulated in high-level liquid waste. Other radioactive waste results from production of plutonium components for weapons, laboratory experiments, and reactor operation. Most wastes are stored in isolated sites at Savannah River (SR), South Carolina; Richland (RL), Washington; and Idaho National Engineering Laboratory (INEL), Idaho. Smaller amounts are stored at the Oak Ridge National Laboratory (ORNL), Tennessee; the Los Alamos Scientific Laboratory (LASL), New Mexico; and the Nevada Test Site (NTS), Nevada.

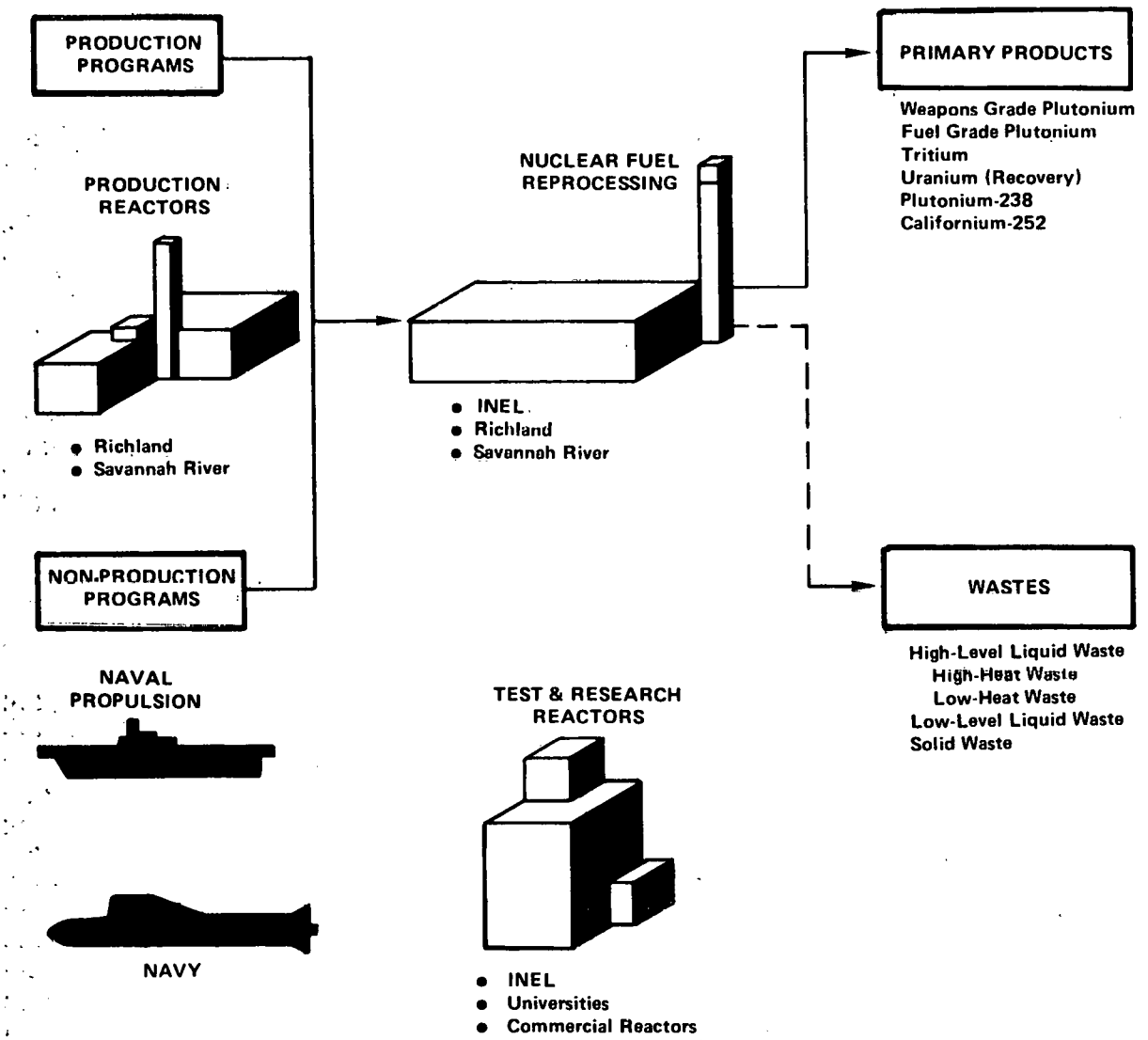
The following table shows the present inventories of defense wastes and projections to 2000, when long-term disposition operations are expected to begin for HLW's and TRU wastes. The very large projected increases in TRU waste and LLW quantities and their wide ranges are shown in the table below. These increases are due to anticipated decontamination and decommissioning (D&D) activities of surplus DOE facilities. While precise quantities of wastes generated by D&D activities are not known, the waste quantities will be large. Typical of a large amount of this waste is rubble and soil containing very low concentrations of radionuclides, but nevertheless requiring safe disposal isolated from the biosphere.

Table III-1. Defense Waste Inventory

DEFENSE WASTE	VOLUME ($10^3 m^3$)	
	CURRENT	PROJECTED TO 2000
HLW	283	320
TRU Waste		
Buried	256	256
Retrievably Stored	55	250-3350
LLW	1470	2500-6800

The objective of the Defense Waste Management Program is to ensure that DOE radioactive wastes are handled, processed, stored, and disposed of safely. In the near term, the specific objective is to provide the required confinement of radioactive waste in a way that is compatible with potential long-term management practices. The long-term objective is to continue to provide the required confinement of radioactive wastes (1) with minimum reliance on future maintenance and surveillance by man and (2) in a way that gives a high assurance of complete isolation from man's environment while the waste is a potential hazard.

The Defense Waste Management Program seeks to safely manage the inventories of radioactive defense wastes as well as wastes that may be generated in the future.



Nuclear Waste from Fuel Reprocessing

1.0 DECONTAMINATION AND DECOMMISSIONING

The D&D of surplus defense-related DOE facilities is a separately funded subactivity accomplished as part of the Surplus Facilities Management Program (SFMP) described in the section on Remedial Actions. The objective of Defense D&D is to reach a point where no further maintenance and surveillance of the surplus facility are required because of radiological safety considerations. In some cases, decontamination in place may be adequate and in some cases, the facility or a portion of it will have to be removed for disposal. Transportation requirements will be identified and schedules established.

Status

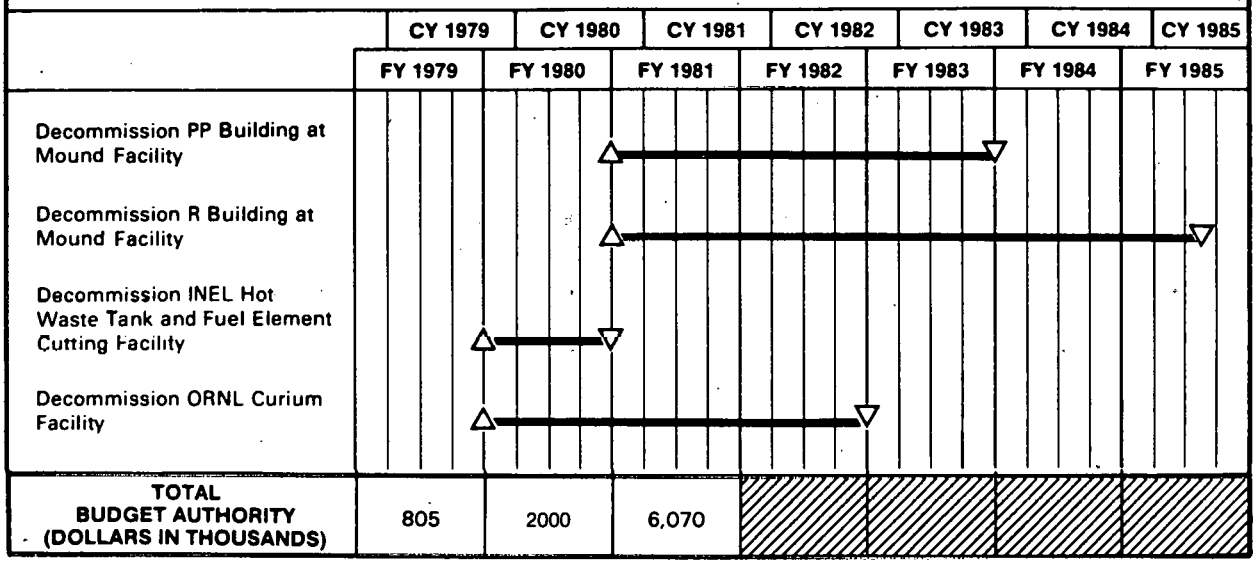
The Defense D&D projects fall into many categories. The projects presently planned to begin through FY 1982 are listed in the following table.

Table III-2. Presently Planned Defense D&D Projects

FY 1980 START	LOCATION
ORNL Curium Facility	OR
INEL Hot Waste Tank	ID
INEL Fuel Element Cutting Facility	ID
FY 1981 START	
Mound Facility Buildings, PP,R	AL
ORNL Waste Holding Basin	OR
INEL Reprocessing Cells	ID
INEL Liquid Metal Furnace	ID
INEL Original Waste Calciner	ID
FY 1982 START	
ORNL Gunite Storage Tanks	OR
INEL CPP Heating/Ventilating System	ID
INEL CPP Carbon Beds; Filters	ID
INEL Hot Waste Tanks	ID

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY DECONTAMINATION AND DECOMMISSIONING

LEGEND:
- △ BEGIN MILESTONE
- ▽ END MILESTONE
- ⬡ DECISION MILESTONE
- ▲ COMPLETED TASK



TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	805	2000	6,070				

2.0 INTERIM WASTE OPERATIONS

The objective of this subactivity is to provide safe interim storage of waste in a way that is compatible with alternatives under consideration for long-term management and that minimizes the potential for release to the environment. Activities for waste management operations have been structured for the following waste categories:

- Interim management of HLW
- Management of low-level solid wastes
- Interim management of TRU-contaminated solid wastes
- Management of ORNL intermediate-level liquid wastes
- Management of airborne wastes

Interim management of HLW requires (1) operation, surveillance, and maintenance of facilities for volume reduction of waste and for interim storage of the existing 283,000 cubic meters of liquids, salt cakes, and sludge in underground tanks and granular calcined solids in underground bins; (2) construction of improved (double-shell) underground storage tanks to eliminate continued use of single-walled and other tanks of earlier design for storage of liquid waste; and (3) process development and facility construction to continue converting liquids to solids and making appropriate transfers to new tanks to provide improved interim storage until long-term disposal options are selected and implemented. Facility construction for the tank replacement program and implementation of improved operational practices will be completed by the end of 1987.

Status

The following improved containment activities are underway:

- Double-shell waste tanks are being constructed to replace old waste tanks and to provide additional storage capacity at SR and RL.
- Existing waste tanks are being evaluated to determine their acceptability for continued use at SR and RL.
- Improvements are being made to existing interim storage facilities at SR, RL, and INEL.
- Stainless steel underground bins are being constructed for additional storage of calcined waste at INEL.

HLW processing and solidification activities are as follows:

- Excess water is being evaporated from waste at SR and RL to reduce the volume requiring storage and to convert liquid to immobile salt cake to reduce the potential for release to the environment; the waste backlog at RL has been evaporated.
- New waste evaporation facilities are being constructed at SR to replace existing facilities.
- Improved technology is being developed and demonstrated at SR for removing waste from old storage tanks.
- Cesium-137 and strontium-90 are being separated from high-heat-generating waste and encapsulated separately at RL to allow storage of salt cake in tanks not equipped with cooling coils; waste backlog has been processed to separate cesium and strontium; encapsulation is continuing.
- Salt wells are being installed in the crystalline salt cake in storage tanks at RL to remove residual liquid.
- The waste calcining facility at INEL is being operated to convert liquid waste to dry, granular solids.
- A new waste calciner is being constructed at INEL to replace the existing calciner, which is reaching the end of its serviceable life.
- Process development to improve waste handling is continuing at SR, RL, and INEL.

Low-level solid wastes are disposed of by shallow land burial. Continued reliance on this type of disposal depends on development of an improved technology base (1982), generation of acceptable and comprehensive operating criteria (1980), and development of stabilization techniques for sites no longer needed to ensure that disposal areas will remain safe over the long term, with minimal reliance on continuing maintenance and surveillance. Upgrading and improvement actions are taken based on periodic site assessments in comparison with applicable criteria and standards. Stabilization of inactive disposal areas and compliance with criteria and standards will be completed in FY 1987. Alternate disposal technologies are being developed and assessed for potential increases in LLW quantities, particularly rubble and soil from decommissioning actions and other high-volume wastes containing very low concentrations of radioactivity.

The management of TRU-contaminated solid waste includes retrievable storage of currently generated waste (pending ultimate disposition).

Shale fracture is used for disposal of intermediate-level liquid waste at ORNL. A new facility is under construction and operational improvements are being implemented. In shale fracture, the waste is mixed with grout and injected into a deep underground shale bed where it solidifies as thin grout sheets and fixes the wastes in place.

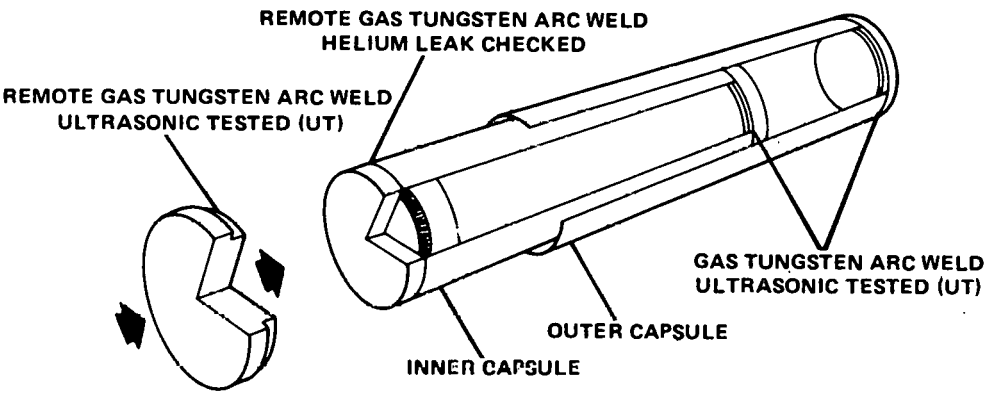
Airborne wastes are contaminated gases generated during nuclear material processing and handling activities. The gases are treated by techniques such as filtration and scrubbing and are then monitored and released under controlled conditions.

Defense waste management operations are conducted on a site-by-site basis with overall program coordination provided by Headquarters. The waste management operations at each major site are described in the following sections.

2.1 Hanford Reservation

Since 1944, the Hanford Project, located near Richland, Washington, has been producing special nuclear materials for defense and research. High-level radioactive waste has been and will continue to be accumulated as part of the process of producing these nuclear materials.

HLW resulting from the processing of nuclear fuel is initially stored in underground carbon steel-lined concrete tanks in the form of alkaline liquids together with precipitated sludge layers. Most of the long-lived (30-year half-life), high-heat-emitting isotopes, strontium-90 and cesium-137, are removed and doubly encapsulated. After the heat generated by radioactive decay of the short-lived fission products (those with half-lives of approximately 2.5 years or less) has diminished appreciably, water is evaporated from the liquid waste to form damp salt cake to reduce volume and mobility. The existing storage facilities for HLW consist of large underground tanks for salt cake, sludge, and liquids, and a stainless steel-lined concrete basin filled with water for the encapsulated strontium-90 and cesium-137.



Strontium and Cesium Capsules

The liquid waste is being processed to less mobile solids, and residual liquids are placed in double-shell tanks (some are built and others are under construction or planned) for safety for an interim period. Alternatives for long-term management of HLW are being evaluated. Interests of present and future generations must be considered. Many approaches to long-term waste management have been identified and studied.

TRU waste and LLW are also generated at Hanford. TRU waste is retrievably stored for future disposal while LLW is disposed of by land burial onsite.

Status

The current HLW treatment program is scheduled to be completed in the early 1980's, at which time HLW will be in three forms and stored in the existing facilities. The damp salt cake and precipitated sludge will be in the single-shell tanks; the nonevaporable residual liquor will be in the double-shell tanks; and most of the high-heat-generating strontium-90 and cesium-137 will be sealed in double-wall metal capsules stored in the water basin.

The stabilization and isolation of the 149 old single-shell waste storage tanks is continuing. Drainable interstitial liquid waste is being removed from the crystalline salt cakes and sludge which will remain in the single-shell tanks for the interim period. Fill-lines and other connections into the older tanks are being disconnected and sealed. These efforts are directed toward providing safe storage of the Hanford HLW until the long-term waste management program is implemented.

Other specific interim waste management activities at Hanford include:

- Interim storage of TRU waste
- Surveillance and maintenance of waste management facilities
- Disposal of LLW by land burial
- Development of improved processes and facilities for safe handling, storage, and disposal of DOE radioactive waste
- Construction of improved waste handling and storage facilities

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY INTERIM WASTE OPERATIONS
TASK HANFORD OPERATIONS

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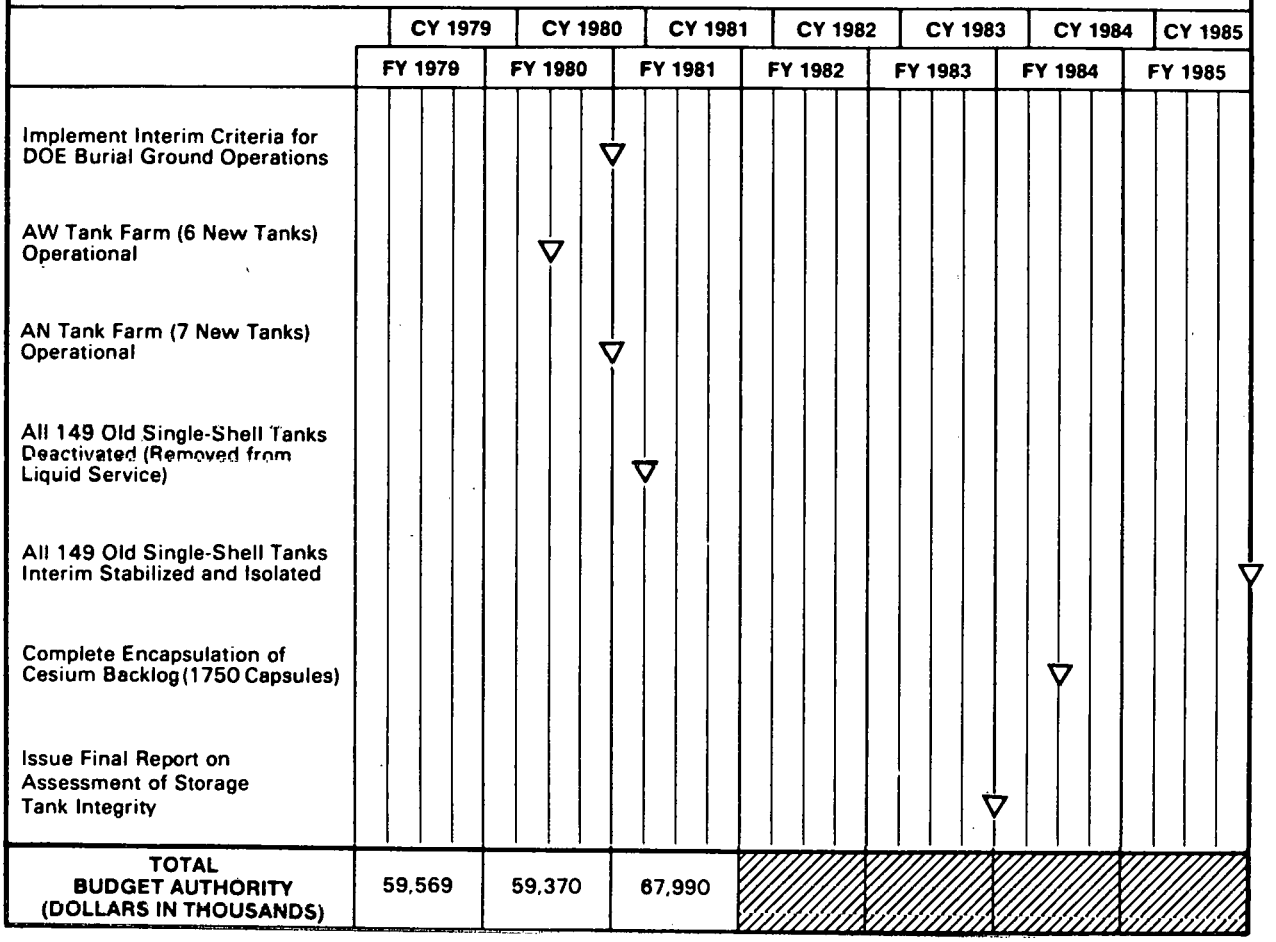
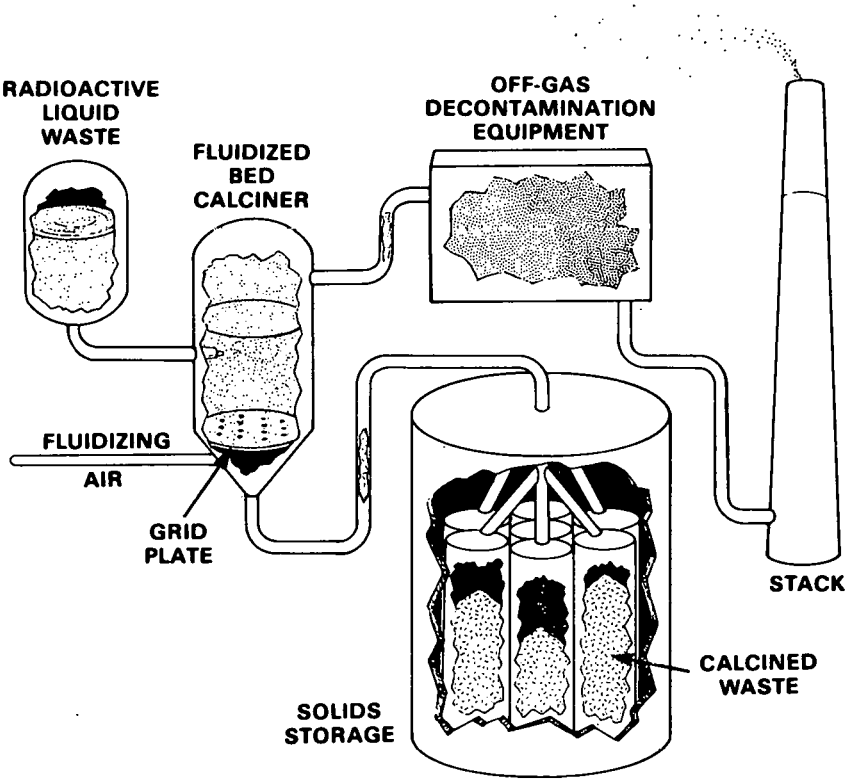


TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	59,569	59,370	67,990				

2.2 Idaho National Engineering Laboratory

The INEL was established in 1949 to construct, test, and operate nuclear reactors and to support plants and equipment. Since 1949, more than 50 nuclear facilities, mostly reactors, have been built or are under construction or design at INEL. These facilities include the Idaho Chemical Processing Plant (ICPP), which reprocesses irradiated spent nuclear fuel.

Radioactive high-level liquid waste from the reprocessing of spent nuclear fuel elements has been converted to a dry, granular solid by calcining and stored safely in underground stainless steel bins at ICPP since 1963. The high-level liquid waste produced at the ICPP primarily originates from reprocessing fuel elements from the national defense and reactor testing programs; however, some waste also is generated from reprocessing spent fuels from nondefense research reactors. LLW and TRU-contaminated wastes also are disposed of or stored in burial grounds at the site.



ICPP HLW Management Facilities

Waste streams requiring treatment or monitoring are high-level liquid waste from the extraction system, intermediate-level liquid waste, low-level liquid waste, contaminated organic wastes, dissolver and vessel off-gases, and solid wastes

contaminated with radioactivity. All high-level waste streams are solidified; intermediate-level liquid waste is converted to high-level liquid waste and low-level liquid waste, which are decontaminated prior to disposal. Contaminated organic liquids are steam-stripped. All dissolver and vessel off-gases are filtered to remove particulates; selected off-gases can be processed through the gas plant to recover krypton and xenon; the remainder is released to the atmosphere via the stack.

Status

A New Waste Calcining Facility (NWCF) will replace the existing Waste Calcining Facility (WCF), originally built as a demonstration plant, which is nearing the end of its production life. The NWCF, like the WCF, will convert high-level liquid (acidic) waste from ICPP spent fuel reprocessing operations to a dry, granular, solid form.

Specifically designed for remote maintenance to reduce personnel radiation exposure and to improve plant availability (on steam-time) by reducing maintenance turnaround time, the NWCF is sized to process all HLW identified for the next 20 years of forecasted fuel-processing operations. The NWCF has a design net throughput of 3,000 gallons of liquid per day. The construction project completion date is scheduled for FY 1980.

Other activities at Idaho include the following:

- Continued solidification of high-level liquid waste to the calcine form followed by interim storage
- Interim storage of TRU waste in a retrievable mode, and disposal of low-level solid waste by land burial
- Development of improved waste handling and storage facilities
- Construction of a fifth and sixth set of calcine storage bins

ACTIVITY	DEFENSE WASTE MANAGEMENT
SUBACTIVITY	INTERIM WASTE OPERATIONS
TASK	IDAHO NATIONAL ENGINEERING LABORATORY

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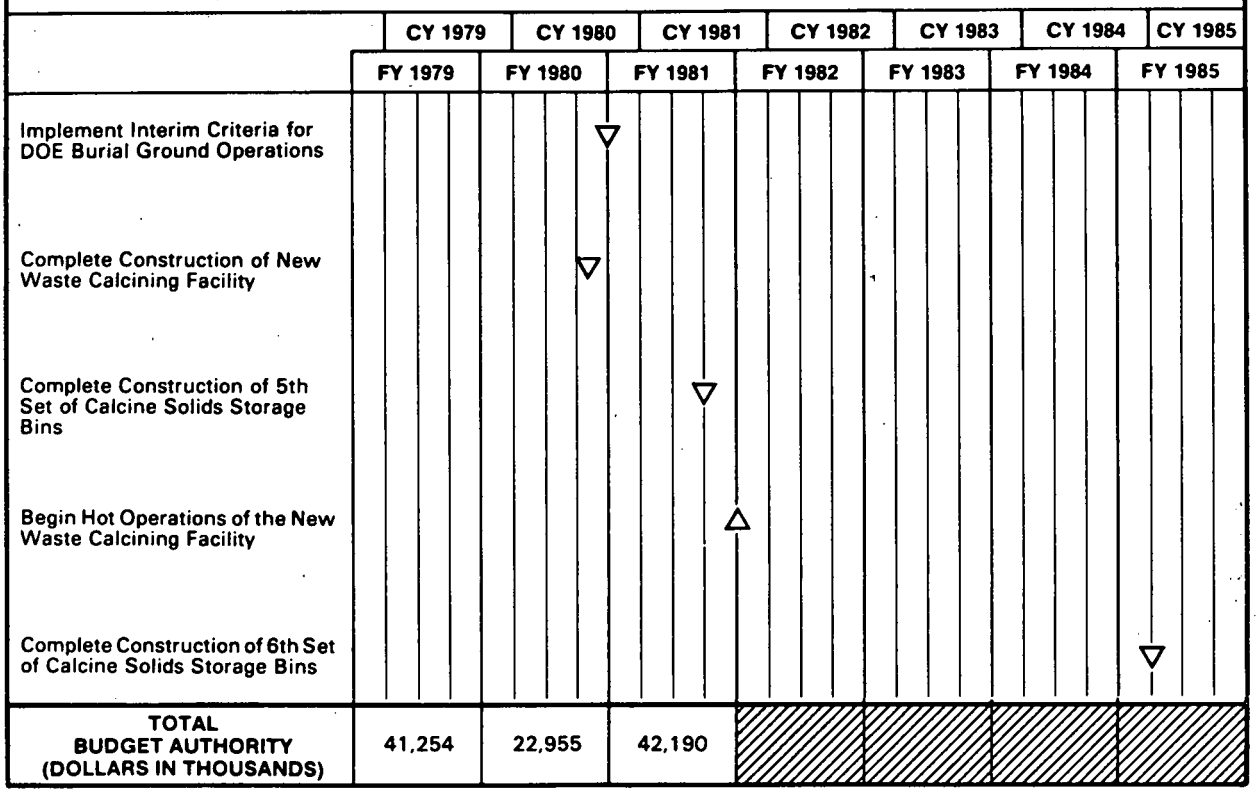


TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	41,254	22,955	42,190				

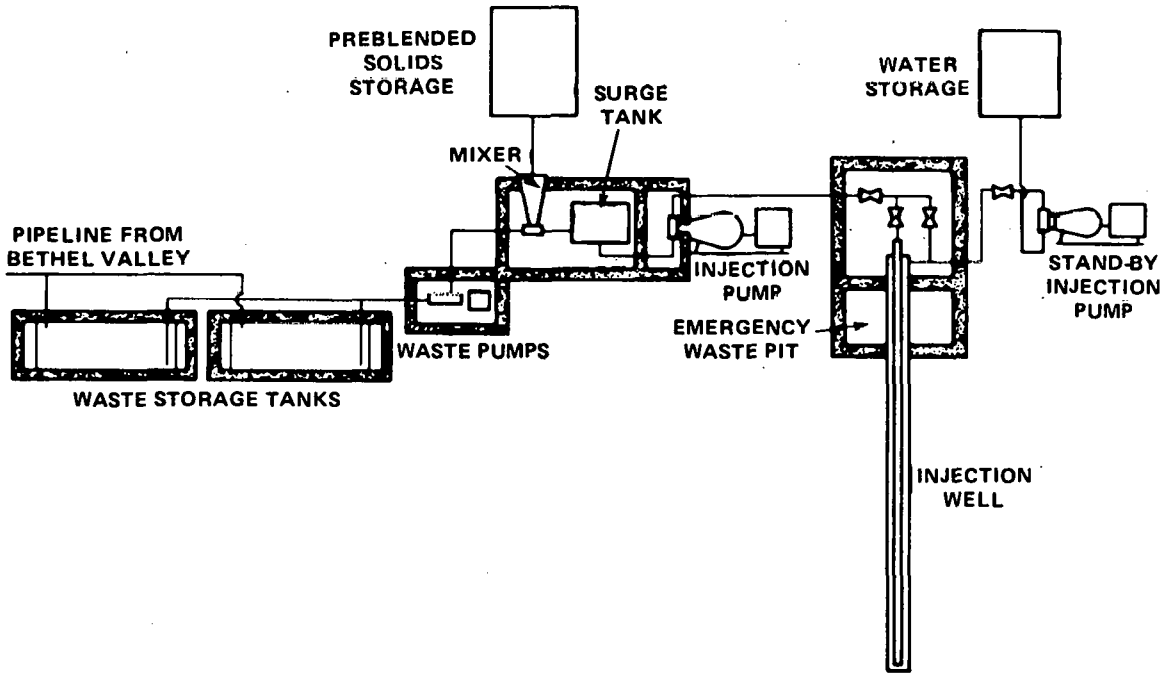
2.3 Oak Ridge National Laboratory

ORNL is primarily a research, development, and test facility. Routine operation of the test reactors and other nuclear facilities produces LLW, TRU-contaminated waste, and intermediate-level waste.

As defined by ORNL, "intermediate-level liquid waste" is aqueous waste produced in their research and development (R&D) activities. Intermediate-level liquid wastes produced at other sites are either concentrated and managed as HLW or decontaminated and the residues managed as solid LLW.

Shale fracturing, with injection of a liquid waste/cement grout under high pressure, has been used to dispose of this waste in shale formations underlying the ORNL site. It is both the most economical and the lowest risk alternative for achieving the long-term waste management goals. This method of disposal will continue unless the program is redirected toward other alternatives for long-term disposal.

One or two injections of intermediate-level waste/cement grout take place per year. This method of disposal has been evaluated for environmental consequences, and an Environmental Impact Statement (EIS) has been issued for management of ORNL intermediate-level waste. LLW is disposed of by shallow land burial. TRU-contaminated waste has been retrievably stored since 1970.



ORNL Shale Fracture Facility

Status

The present shale fracture disposal facility is an old demonstration facility and is approaching the end of its useful life. Construction of a new shale fracture disposal facility began in FY 1979. The facility will be able to handle the waste generated for at least the next 15 years, as well as the sludge that has been accumulated in the interim storage tanks. A second waste evaporator, stainless steel storage tanks, and double containment transfer lines are being installed at ORNL to collect, reduce the volume, and store the intermediate-level wastes pending disposal by shale fracture. These items are replacements for existing handling systems that have exceeded their design lives. After the new shale fracture facility becomes available and liquid waste has been disposed of, the sludges will be disposed of and the old facility and storage tanks will be decommissioned. Experiments are underway to determine the composition of the sludges in the waste tanks, methods to remove them, and the best means to inject them using the shale fracture process.

Other specific waste management activities at ORNL include:

- Interim retrievable storage of TRU waste
- Disposal of LLW by land burial and placement in stabilized condition
- Surveillance and maintenance of waste management facilities
- Development of improved processes and facilities for safe handling, storage, and disposal of DOE radioactive wastes
- Operation of the gaseous waste system
- Design and construction of improved waste management facilities and replacement of existing facilities

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY INTERIM WASTE OPERATIONS
TASK OAK RIDGE NATIONAL LABORATORY

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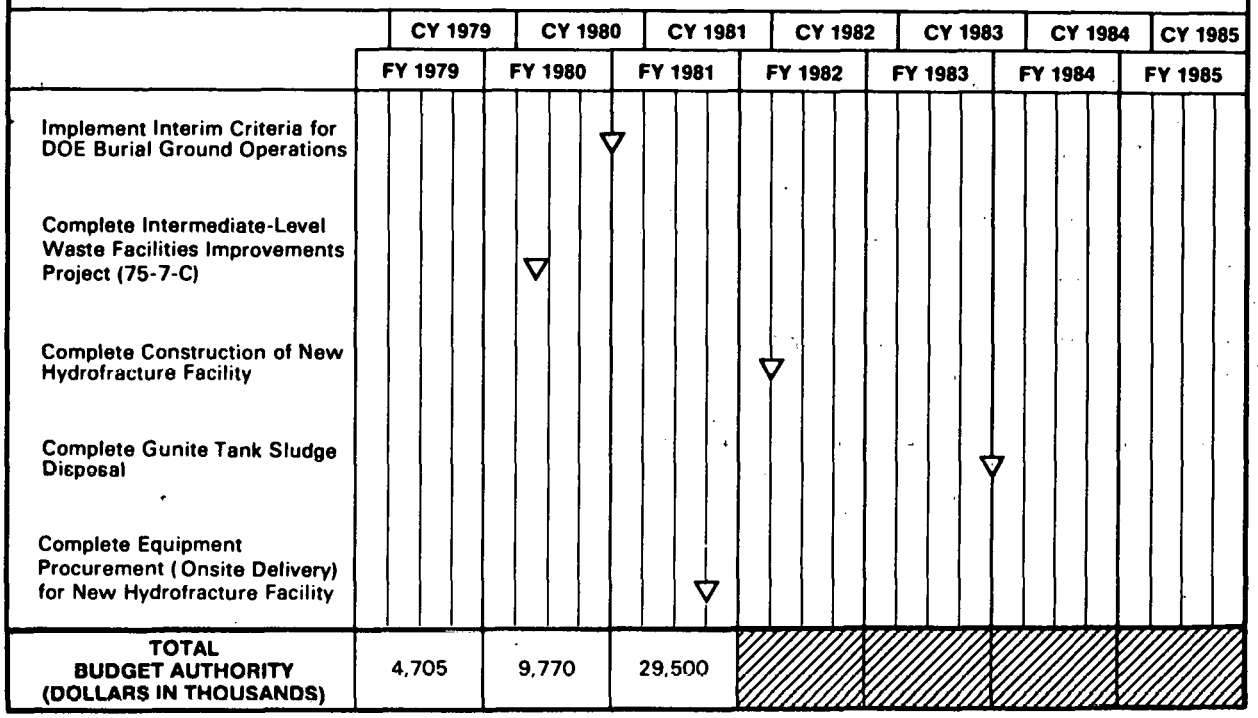
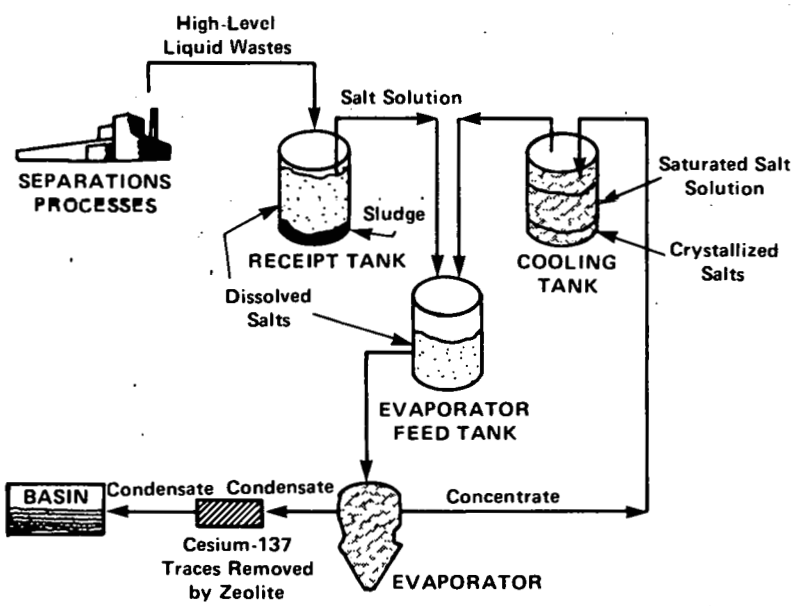


TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	4,705	9,770	29,500				

2.4 Savannah River Plant

The SR Plant was established in 1950 by the U.S. Atomic Energy Commission (AEC). The SR Plant produces nuclear materials for the national defense. The production of these nuclear materials results in radioactive waste byproducts. At present, the SR Plant has stored approximately 87,000 cubic meters of radioactive HLW in waste tanks. This waste consists of approximately 49,000 cubic meters of high-level liquid waste, 28,000 cubic meters of salt, and 10,000 cubic meters of sludge. This waste currently contains approximately 700 megacuries of radioactivity. In addition to the HLW managed onsite, significant amounts of TRU wastes are generated onsite as well as LLW, which are routinely generated by most nuclear activities. Waste management of the TRU wastes is accomplished by packaging the waste in drums and retrievably storing the waste for future disposal. LLW management is accomplished through shallow land burial at the onsite burial grounds. There are approximately 320,000 cubic meters of solid waste buried onsite and 1,700 cubic meters of TRU waste retrievably stored.



HLW Management

Status

At SR, HLW is being transferred from old obsolete tanks into new, improved double-shell waste tanks which have recently been built or are currently under construction. The objective of the program is to improve the HLW containment at SR Plant. In FY 1978, a demonstration to clean out one of the older tanks was initiated, and was successfully completed in FY 1979. In FY 1980, operations to transfer waste salt cake from old single-shell and double-shell tanks into new double-shell tanks will begin. These operations involve dissolving the salt cake in the old tanks, transferring the liquid to waste evaporators, and recrystallizing of waste into new double-shell tanks. The salt removal operations will continue through FY 1981 and will be followed by operations to transfer sludge waste to new tanks.

Specific current programs for the interim waste management activity at the SR Plant include:

- Storage and surveillance of all waste management facilities
- Conversion of liquid wastes by evaporation to less mobile salt cake
- Refinement of technology for sludge removal and tank cleanout
- Upgrading of HLW storage (replacing old waste tanks)
- Development of improved processes and facilities for safe handling, storage, and disposal of DOE radioactive wastes
- Storage of TRU waste in a retrievable mode, and verification of the integrity of containers used for retrievable storage of TRU waste
- Storage of combustible liquid waste, and converting it to non-TRU solid waste by incineration or other means
- Completion of process and equipment assessments for retrieval, conversion, and long-term storage of TRU waste
- Construction of improved waste handling and storage facilities

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY INTERIM WASTE OPERATIONS
TASK SAVANNAH RIVER PLANT

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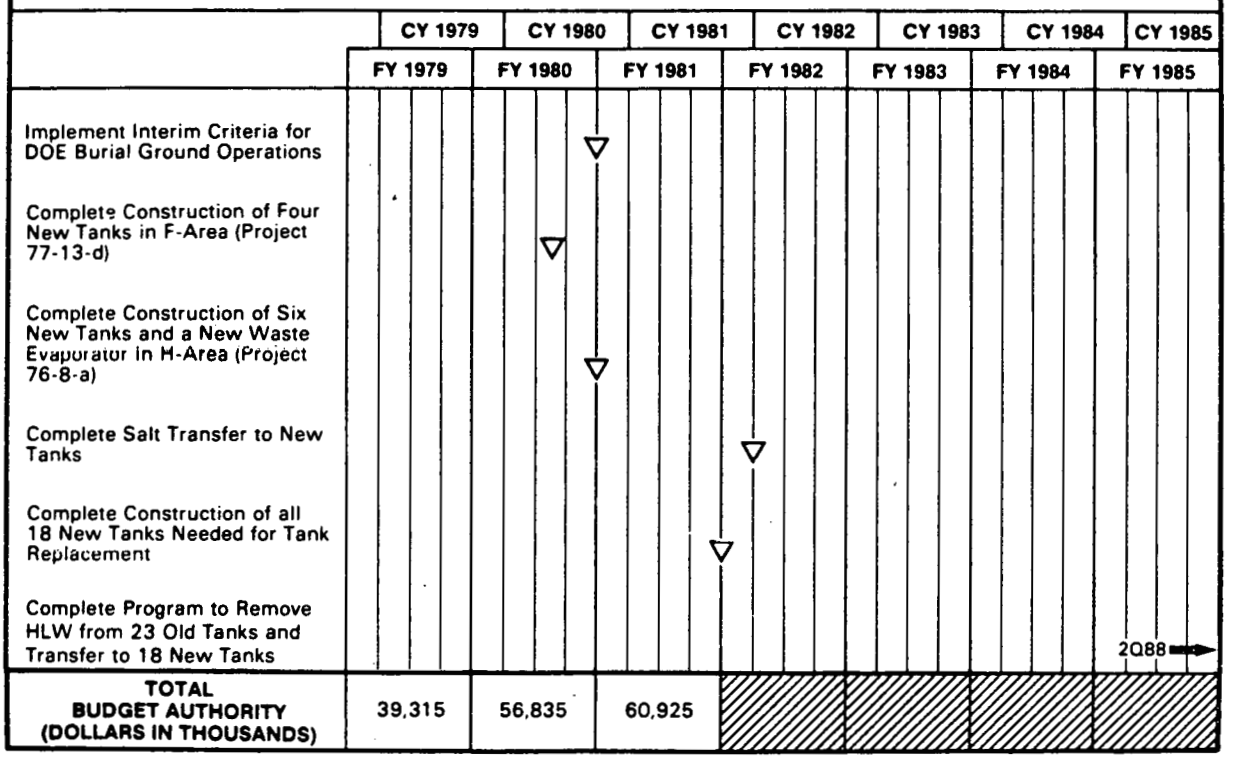


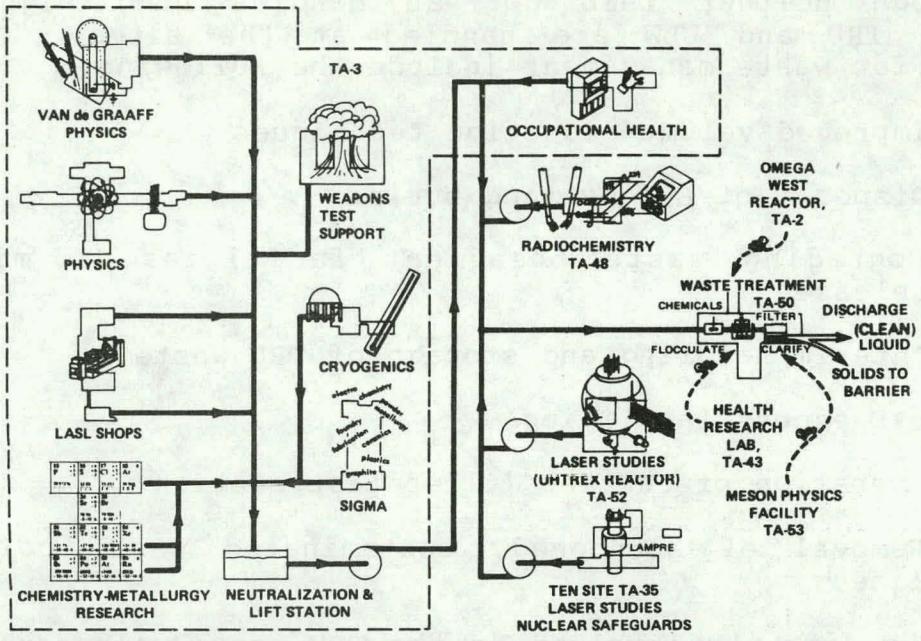
TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	39,315	56,835	60,925				

2.5 Other Sites

DOE operates solid radioactive waste burial grounds at NTS, LASL, and Sandia Laboratories (SL). The NTS, located near Mercury, Nevada, is a defense research and development facility. Although most of the radioactivity at the NTS remains at the locations deep underground where nuclear tests have been conducted, many sources contribute to radioactive waste on the surface. These include the following:

- Radioactive waste and activated materials remaining from early atmospheric tests
- Waste generated from equipment decontamination
- Radioactive waste generated by and remaining from experiments and projects conducted at NTS not related to underground nuclear testing
- Radioactive materials in tailing piles and debris from post-shot tunnel reentry and rehabilitation activities
- Radioactive materials and wastes generated elsewhere by defense programs and related activities sent to the NTS for storage or disposal

The Albuquerque Operations Office (AL) has management responsibility for nine weapons laboratories and facilities. Only two facilities--LASL and SL--have direct DOE/Office of Nuclear Waste Management (NEW) funding for radioactive waste management. (Funding for waste management at the other facilities is provided by DOE/Defense Programs.) Both LASL and SL are involved in research and development; however, neither laboratory stores or handles HLW. At NTS, no HLW is handled except in specific experiments conducted by the commercial waste isolation program. At all of the sites, TRU-contaminated wastes are either shipped offsite or stored retrievably while LLW disposal is accomplished by burial following solidification of any liquid waste, encapsulation, dewatering, and ion-exchange processes.



LASL Control Waste Collection System

Status

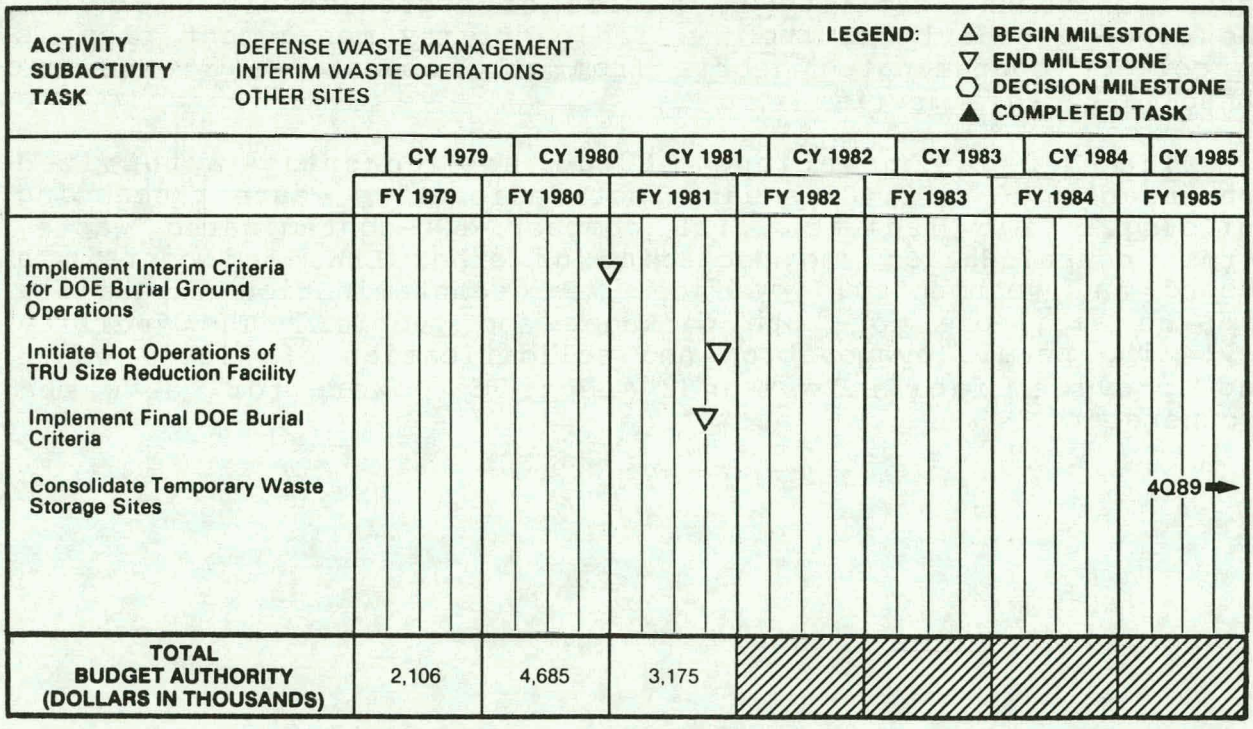
A new radioactive waste management plan is currently being implemented at NTS. The plan is based on the expansion of the waste management facility to a size of approximately 90 acres. The concept underlying the new radioactivity management plan is to collect contaminated debris from other locations at NTS and consolidate this debris.

The Nevada Operations Office has recently authorized construction of a 2,400-square-foot radioactive waste processing building. The facility will compact TRU-contaminated waste, permit consolidation and packaging of other LLW, and contain a record and documentation office. A decontamination capability will be available for both packages and people. The facility will also permit evaporation and solidification of liquid waste and provide facilities and electric power for a waste incinerator.

Although neither LASL nor SL handles HLW, significant amounts of TRU and LLW are handled at the sites. Current activities for waste management include the following:

- Improved volume-reduction techniques
- Disposal of LLW by land burial
- Upgrading waste treatment facilities to minimize releases
- Interim handling and storage of TRU waste
- D&D excess facilities
- Operation of central filter test station
- Removal of abandoned, contaminated waste collection lines

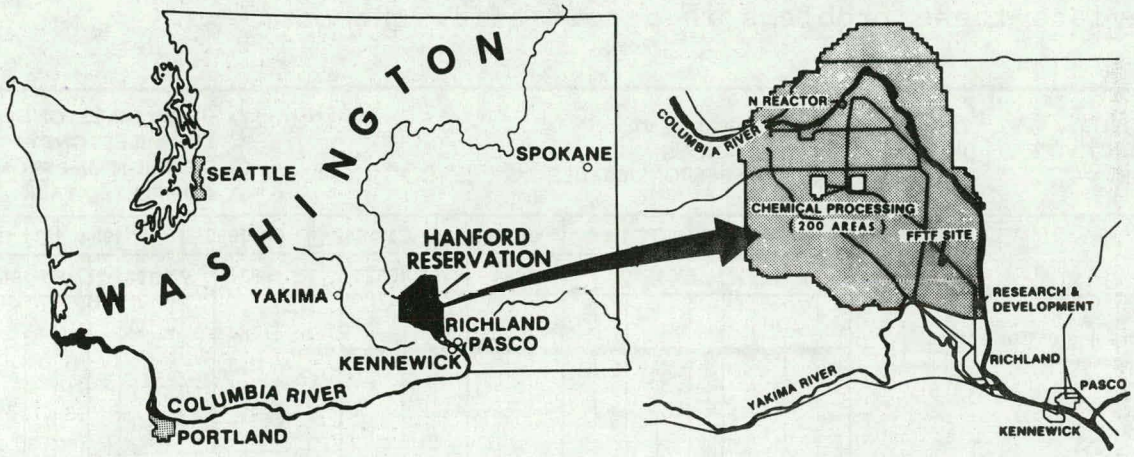
LASL is directly involved in the TRU waste volume-reduction research, development, and demonstration (RD&D) activities. A new TRU waste volume-reduction facility began test operations in FY 1979, and full-scale operations are scheduled to start in FY 1980.



2.6 Richland Landlord Responsibilities

The defense nuclear facility near Richland, Washington (RL), is on a 570-square-mile reservation. The operation and maintenance of this facility present a very large "landlord" responsibility which is not directly attributable to any particular waste facility or program at the site. Rather, landlord responsibilities provide direct support to the entire site operation and all waste facilities and programs at the site in general. The specific objective of this task is to provide general site support (nonprogrammatic) funding for the safe and efficient operation of the Hanford Reservation.

Funding is provided by the Headquarters program which supports the major portion of the work being conducted at the installation. NEW has been assigned landlord funding responsibility for Rockwell-Hanford as part of the defense waste program.



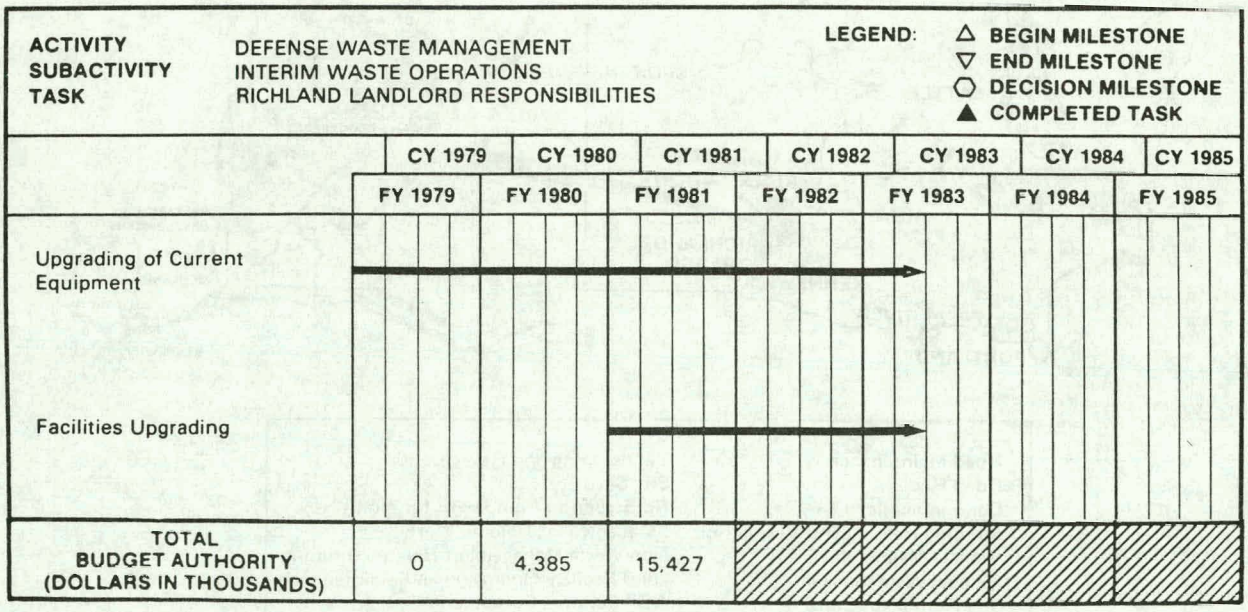
Road Maintenance	Landscaping and Revegetation
Road Repair	Site Security
Communications	Construction Equipment for Non-Waste Management Related Work
Building Heating and Ventilation	Non-Waste Management Related Building and Facility Operation and Maintenance
Vehicle Maintenance	ADP Support Equipment
General Warehousing	General Purpose Equipment
Site Administration	General Plant Projects
Office Building Construction and Maintenance	
Non-Contaminated Waste Treatment	

Hanford Reservation and Landlord Responsibilities

Status

Landlord responsibilities and activities will continue at RL at a level necessary to support DOE program activities at the site. Maintenance and replacement of equipment and general support facilities are necessary at RL and are currently in progress. New heavy equipment is scheduled to be purchased to replace old unreliable equipment.

Numerous facilities at RL were constructed more than 30 years ago. Past operating and capital budgets have not been adequate to maintain these facilities in the physical condition and up-to-date technological adequacy required for continued long-term operation. Good performance has generally been achieved by careful prioritization of maintenance efforts. However, equipment and facilities deficiencies have accumulated which adversely affect productivity and efficiency. A major program of facility upgrading is scheduled to start in FY 1981 to alleviate these problems in a cost-efficient manner.



3.0 LONG-TERM WASTE MANAGEMENT TECHNOLOGY

The program for long-term management of nuclear wastes requires technology development, engineering studies, conceptual designs, tests, demonstrations, and evaluations as a basis for selecting site-specific alternatives consistent with the National Environmental Policy Act (NEPA) and for building associated facilities to implement them. The R&D program in progress is designed to fill the technology gaps for long-term management. Concurrently, the Transportation Technology Center will identify transportation needs and will establish programs to ensure that hardware is in place when needed.

The long-term waste management R&D program is organized by waste category (HLW, TRU, LLW, airborne) and by site. Specific sites have been designated "lead" for the development of technology for a given waste category: HLW at SR, TRU waste at AL, LLW and airborne waste at ID. Although R&D work on one particular waste category may be in progress at several sites, the lead site is responsible for coordination of the overall effort.

The HLW task is developing immobilization processes such as the proposed reference process for the proposed SR Defense Waste Processing Facility (DWPF). This facility is planned to begin operation in FY 1989. Of the three DOE sites storing HLW, SR will be the first to implement a long-term waste management option. RL and INEL will follow. The SR HLW program is consistent with DOE's stated plans to limit the use of the new waste storage tanks to approximately 20 years.

R&D on TRU-contaminated solids includes design and operation of facilities to develop technologies for safe and economic handling, treatment, and packaging for disposal. Incineration is being developed as the major volume reduction technique for combustible materials, along with surface decontamination and ash or residue immobilization processes. The proposed reference immobilization process is now being developed for the proposed Idaho TRU Waste Treatment Facility which will prepare the currently stored waste for geologic disposal beginning in FY 1987. Techniques and requirements for recovery and treatment of previously buried TRU wastes at Idaho are being developed.

Airborne waste R&D is developing techniques for capture, treatment, and storage/disposal of long-lived radioactive effluents from off-gas streams to meet the more stringent regulations imposed by the 1977 Clean Air Act. The resulting emission control regulations are expected to take effect in the 1987-1988 period. The technology development program will be completed in FY 1984.

LLW disposal techniques are the subject of long-term waste management R&D. This work is centered on developing improvements

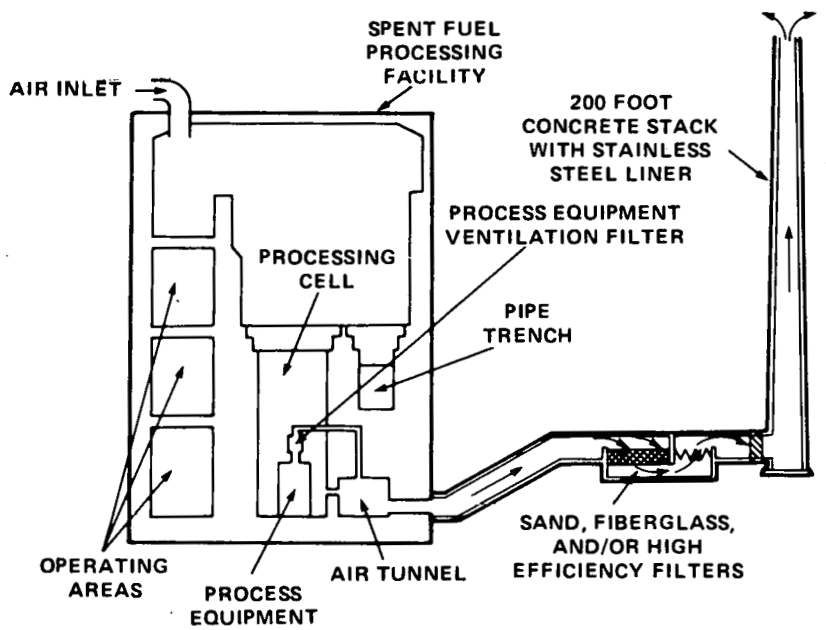
in the technology by establishing formal standards and criteria for LLW burial, tests and demonstration of stabilization techniques and burial operations, and formal characterizations of each LLW burial ground for analysis of its behavior. A final report on advanced treatment technologies is scheduled for completion in FY 1985.

The development of long-term waste management technologies has considered and will continue to consider future criteria and standards of the Nuclear Regulatory Commission (NRC) and the Environmental Protection Agency (EPA). These criteria and standards and applicable NRC licensing requirements will be satisfied. All DOE HLW repositories will be licensed by the NRC. The HLW immobilization R&D programs have been expanded to decrease emphasis on any particular waste form or process and are now emphasizing an examination of alternatives for comparative purposes and to help in the selection process.

3.1 Airborne Waste

Nuclear reactors, irradiated fuel storage, fuel reprocessing, and weapons-related activities all produce airborne radioactive wastes. Secondary waste management activities such as waste combustion and solidification also generate related wastes. Numerous programs are underway in DOE for the management of these airborne wastes. Technologies are being developed within the NEW for the concentration, recovery, immobilization, storage, and monitoring of airborne wastes from the nuclear fuel cycle.

Air flowing out of all processes involving radioactive materials must be filtered, since airborne mists or small particles may contain traces of the radioisotopes. Particulate material in the gaseous waste streams is removed by scrubbing or filtration through sand or fiberglass beds and/or high-efficiency media. Each high-efficiency filter stops at least 99.97 percent of the particles. Radioisotopes emitted as gas require special treatment. For example, control of radio-iodine requires special adsorbing material in filters to remove it from off-gas streams. The very small quantities of radioactive material that escape to the atmosphere through high stacks are within environmental emission limits established by the Federal Government.



Removal of Airborne Wastes

Available technology and practices are adequate to meet current health and safety standards. The Airborne Waste task is aimed primarily at cost-effective improvements, quality assurance, and new capability in areas where more restrictive standards will apply in the future.

The objectives of this task are to increase the service life and reliability of filters; and to develop improved technology for additional collection, fixation, and long-term management of gaseous radionuclides to meet future EPA regulations and as low as reasonably achievable (ALARA) criteria, both requiring further reductions in airborne radioactive releases from defense program facilities. The strategies to produce operational processes for the treatment of airborne wastes will involve these stages: (1) development of individual technologies for separation and for storage of each radionuclide, (2) development and testing of combined modular separations and storage subsystems for each radionuclide, (3) design, construction, and operation of an integrated off-gas facility.

Status

The Idaho Operations Office, with the support of the Exxon Nuclear Idaho Company (ENICO), has the lead responsibility for the airborne waste technology program. In support of the objectives of this program and the long-term strategy for defense wastes, the following specific R&D activities are underway:

- More durable filters are being developed for service in off-gas streams from radioactive processes that emit acid vapors and/or high temperature gases.

- Several prefilter concepts are being developed for capturing radioactive particulates near their source. These concepts will extend the service life of high-efficiency particulate air (HEPA) filters and thus reduce the costs for their replacement and disposal.

- Improved monitoring systems are being demonstrated for specific long-lived airborne radioactive constituents in the off-gas of waste processes, particularly iodine-129, carbon-14, and tritium.

- Technology is being developed to remove tritium from air and water, to immobilize it, and to store it safely.

- Improved filter test methods are being developed for DOE radioactive iodine and particle filtration systems. This work also supports the development of filtration standards, regulations, and test procedures.

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY LONG-TERM WASTE MANAGEMENT TECHNOLOGY
TASK AIRBORNE WASTES

LEGEND:
- △ BEGIN MILESTONE
- ▽ END MILESTONE
- ○ DECISION MILESTONE
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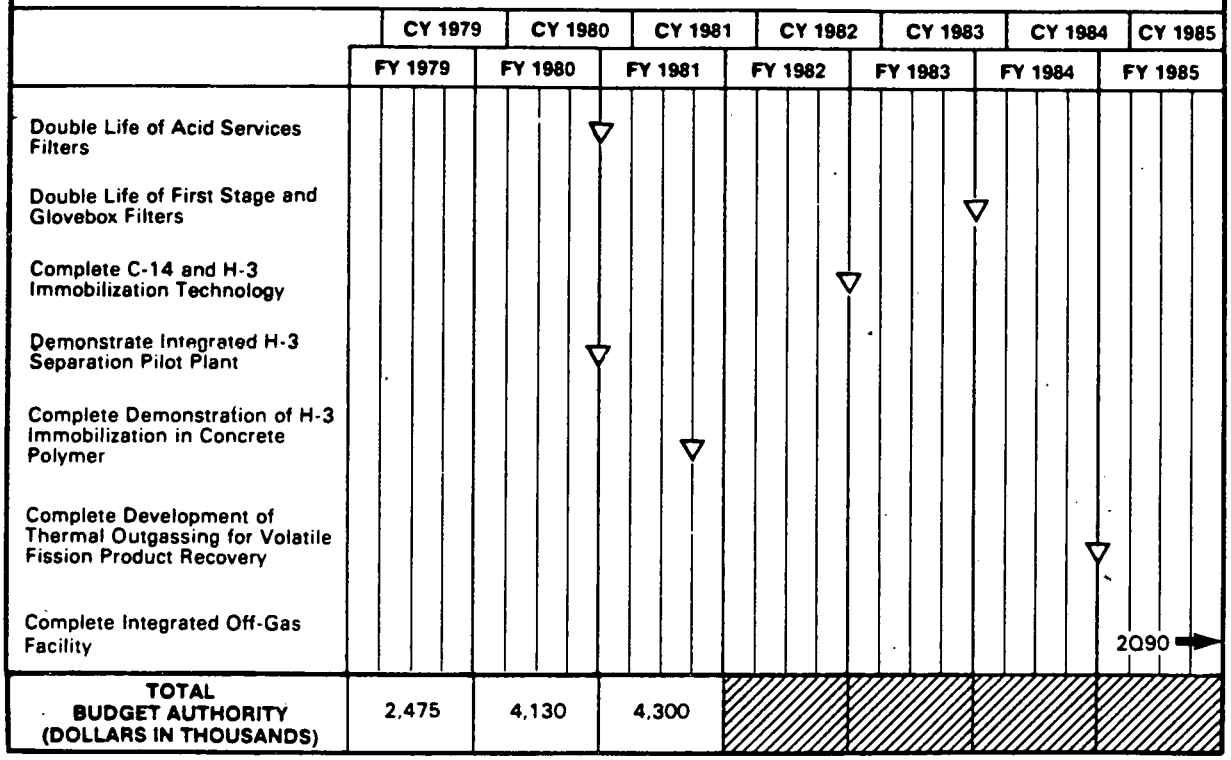


TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	2,475	4,130	4,300				

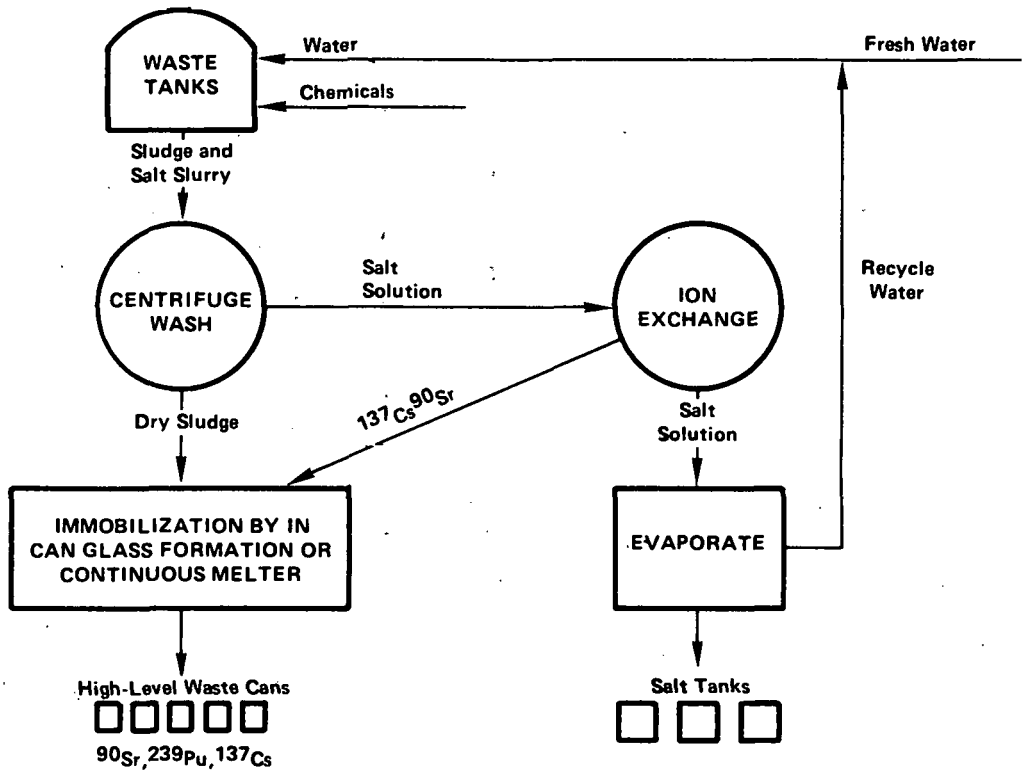
3.2 High-Level Waste

3.2.1 High Level Waste Management Technology

HLW's contain more than 99 percent of the residual radioactivity produced in the fuels and targets during reactor operations. They include essentially all the fission products and most of the actinides that were not recovered for use. DOE has full responsibility for managing the HLW resulting from defense activities and additional responsibility for managing existing commercial HLW and any that may be generated in one of several alternative fuel cycles.

Most of the existing high-level nuclear wastes in the United States have been generated in defense activities: i.e., in producing plutonium and tritium for nuclear weapons at the DOE plants at Hanford near RL, Washington, and at SR near Aiken, South Carolina, and in processing spent naval reactor fuels at the ICPP near Idaho Falls, Idaho. An inventory of approximately 75 million gallons of high-level defense waste containing about 1.2×10^9 curies of radioactivity is on hand. Production is continuing at the rate of 0.5-1 million gallons a year, and in 1990 the inventory of defense radionuclide is projected to reach 1.8×10^9 curies.

The basic DOE plan to achieve the goal of HLW isolation from the biosphere is: (1) to develop technology to support a realistic long-term management alternative for each DOE HLW site, of which waste immobilization is one promising part of the process, (2) to develop the candidate waste disposal forms and processes with sufficient scaleup to provide design data for full-scale facilities, and (3) to construct and operate the facilities necessary to implement the selected alternative. All three of these major activities will overlap to a degree as the plan is implemented.



Conceptual Waste Solidification Process for SR HLW

Status

The long-term high-level nuclear waste management program is widely assigned through the waste-producing sites, DOE laboratories, universities, and industrial firms. Beginning in 1979, all aspects of the program were managed through the DOE SR Operations Office, with personnel in the Atomic Energy Division of E. I. Du Pont de Nemours and Company acting as technical advisors. Several very broadly based studies which cover several reasonable alternative processes leading to stable, immobile forms for HLW's are in progress.

Within the context of the plan for immobilizing HLW, the following specific activities are underway.

- Identification and assessment of alternatives. The basic task has been accomplished for the DOE wastes at SR, Hanford, and ID and also for the existing Nuclear Fuel Services (NFS) commercial wastes. Selection of an alternative will be accomplished in accordance with NEPA.

- SR is the first of the three sites to select an alternative for HLW immobilization. The preliminary base alternative is immobilization of wastes for

disposal in deep geologic repositories. The preliminary reference process involves retrieval from existing tanks, volume reduction, immobilization and encapsulation for transportation and emplacement.

- Technology development to support the design of immobilization facilities.

- Continued development of technology to provide data for fully informed confirmation of the preliminary choice, or selection of another alternative.

- Waste form development stressing chemical, thermal, and radiolytic stability and including concretes, calcines, glasses, ceramics, glass ceramics, synthetic minerals, and composites such as coated and uncoated ceramic or glass pellets in a metal matrix.

- Waste form characterization, currently emphasizing geologic leaching, but also including measurements of dispersibility, volatility, stability, product uniformity, and a variety of other properties.

- Initial waste form selection based on a comparison of the measured form characteristics with criteria being developed by the regulatory agencies and by the waste forms production plants, the transportation facilities, and the repositories.

Long-range plans for HLW disposal include the development of performance criteria for immobilized HLW and demonstration that more than one immobilization technique and waste form meet these criteria.

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY LONG-TERM WASTE MANAGEMENT TECHNOLOGY
TASK HIGH-LEVEL WASTE

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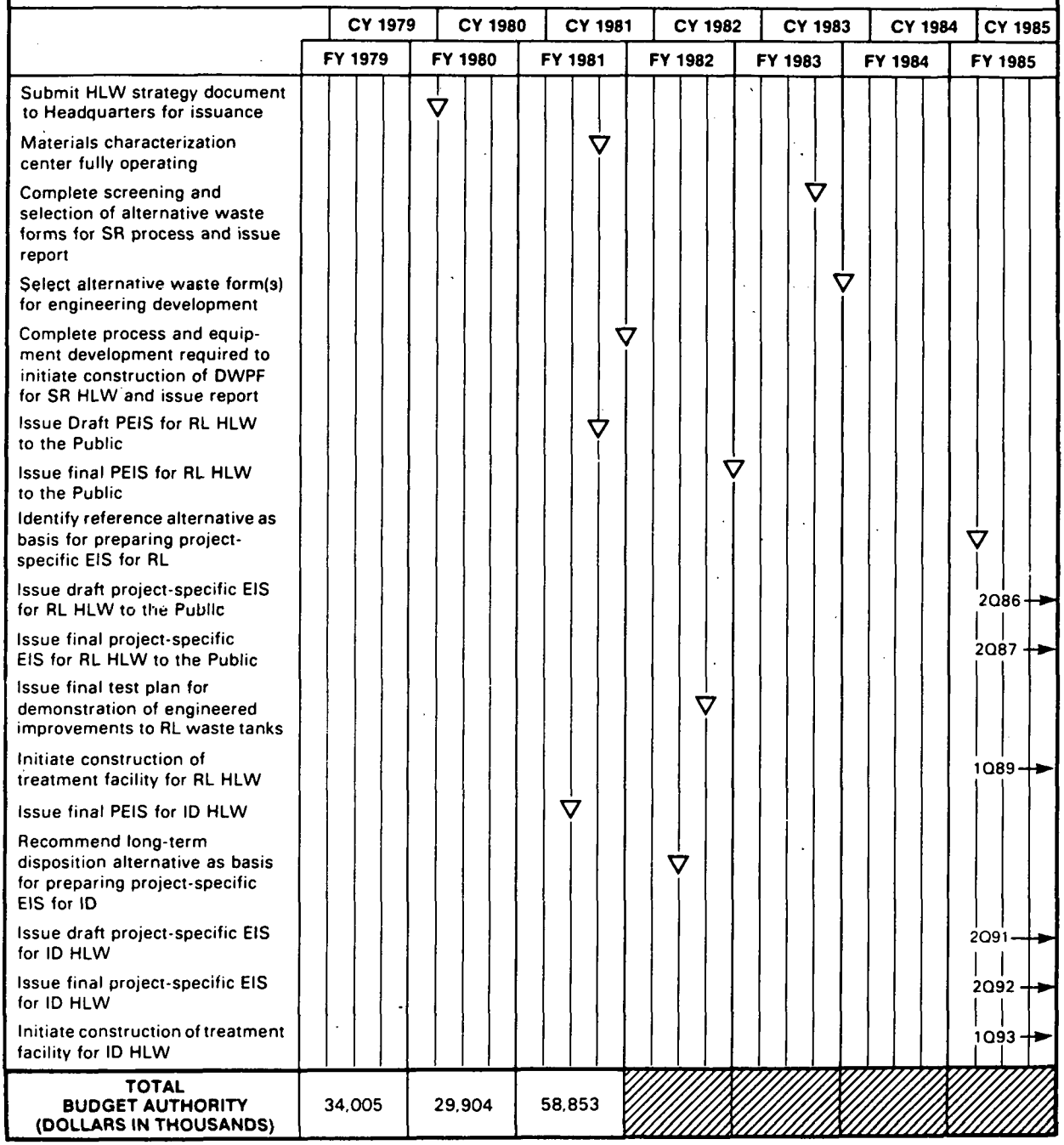
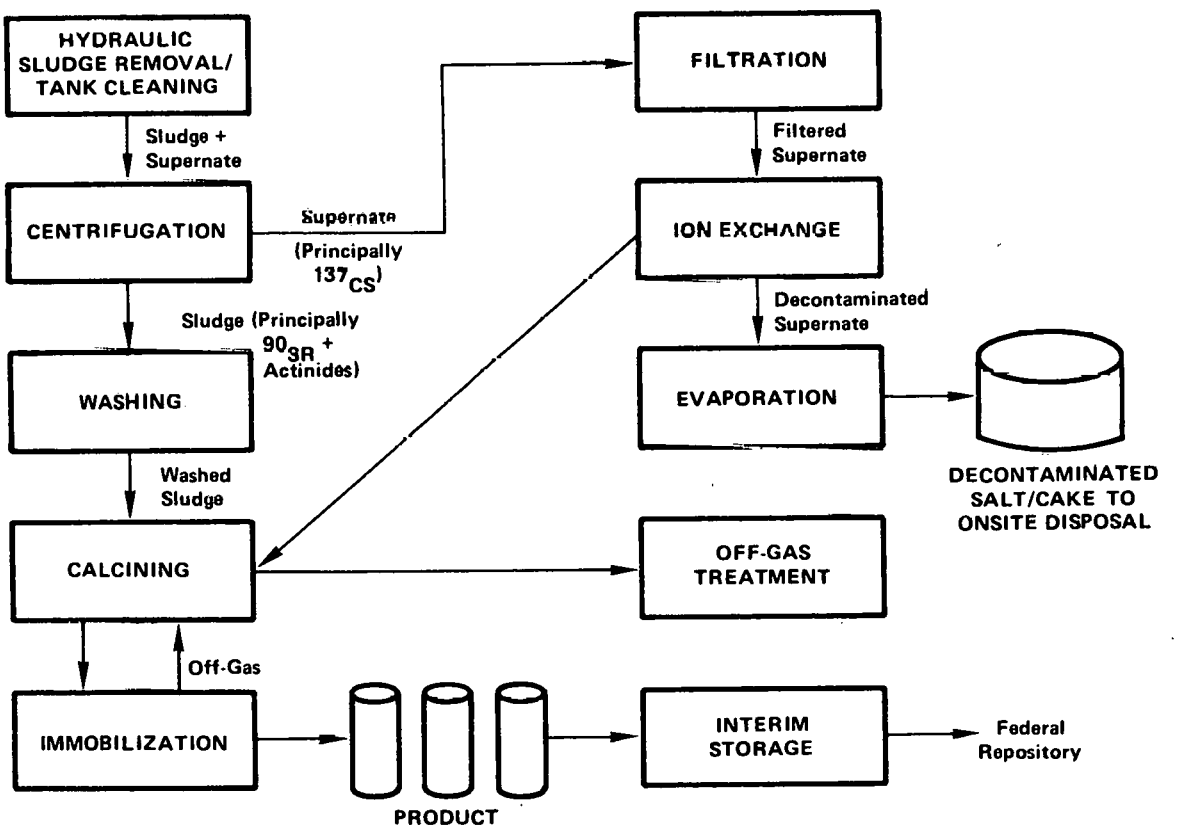


TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	34,005	29,904	58,853				

3.2.2 Defense Waste Processing Facility

DOE's plan for the long-term management of defense HLW is to put them into a form and location suitable for long-term isolation from the biosphere and to minimize dependence on institutional controls to effect such isolation. Because of the difference in waste properties, composition, and surrounding environment between the HLW storage sites, DOE plans to handle each situation separately. SR has been chosen as the first site to implement a long-term HLW management program.

The proposed DWPF project at SR will include facilities for retrieval, immobilization, and temporary storage of the SR HLW. The reference DWPF process shown below involves the following steps: (1) removal of waste from the tanks, (2) separation of the sludge from liquid by physical processes such as centrifugation and filtration, (3) removal of the cesium and some other radioisotopes from the liquid by ion exchange, (4) incorporation of the sludge and cesium into a suitable waste form such as borosilicate glass, (5) evaporation of the residual solution to a salt cake (containing less than 0.1 percent of the total activity), (6) interim storage of containers of the HLW form in a natural convection air-cooled facility prior to transport to a DOE repository, and (8) disposal of the residual salt onsite.

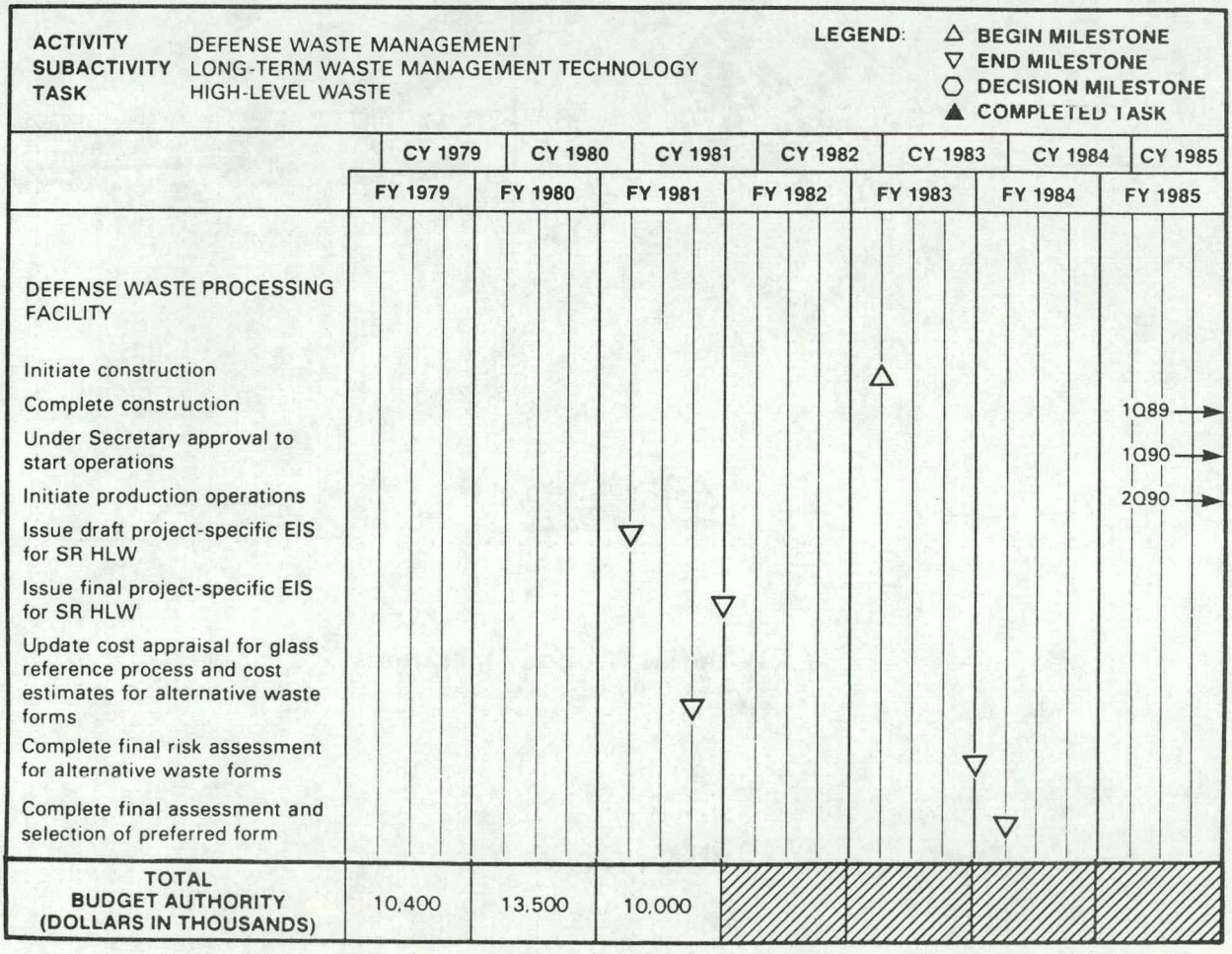


Reference Process for DWPF

Status

The technology development program now underway and proposed for the future is aimed toward waste form selection. The type of geologic formation and the specific site for the repository have not yet been chosen. The present technology development program does not foreclose any of the repository options being considered because the waste composition and container size would be compatible with any option. The outer container material may change depending upon the type of geologic formation, but there would be adequate time to implement any change, and the technology development program is not sensitive to the outer container material.

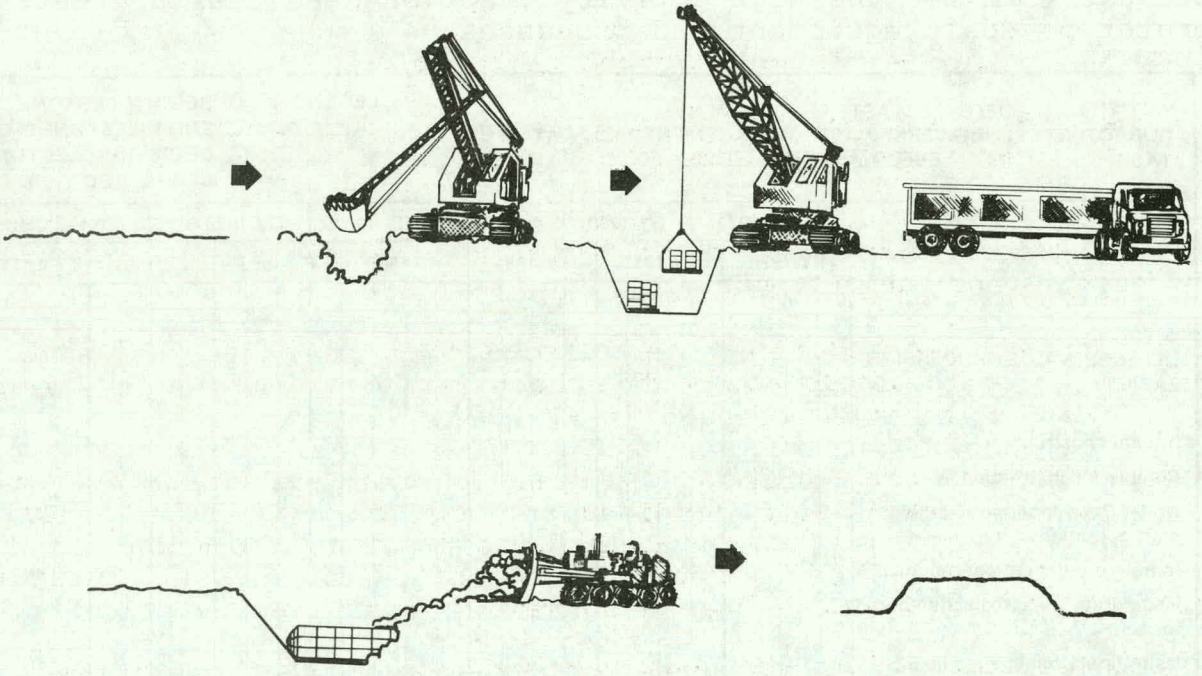
R&D to date has included a waste tank sampling program to characterize the waste, preparation, and evaluation of promising waste forms in shielded cells using actual waste; evaluation of container materials using simulated waste; demonstration of cesium removal at small and intermediate scales; small-scale tests of centrifugal sludge-liquid separation using actual waste; engineering and cost studies assuming concrete or glass as the product form for the high-activity fraction; and startup tests of prototype scale equipment and processes.



3.3 Low-Level Waste

Low-level contaminated wastes do not contain significant amounts of TRU (10 n Ci/g) nuclides and have relatively low levels of radioactivity. Such contaminated waste may come from a wide variety of sources, including manufacturing, processing, testing, and research. Depending on its origin, it may be contaminated with almost any radioactive isotope in small amounts. The kinds of materials being handled are equally varied, ranging from paper towels and laboratory gloves to materials of construction from obsolete nuclear facilities.

The shallow land burial of LLW is an established practice for the disposal of such wastes. Stabilization of the waste burial site or other steps taken can limit the potential for radioactive releases to the biosphere or migration of radionuclides to the water table. The objective of the LLW program is to provide long-term planning and advanced technologies for LLW that will protect public health and safety, meet applicable criteria and standards, and optimize the future LLW waste management system.



LLW Burial Ground Operations

Status

The Idaho Operations Office has been designated as lead office for the LLW program with assoiciate lead at DOE's Oak Ridge Operations Office. Those groups chose EG&G at the INEL and Union Carbide at ORNL to provide technical assistance for their management activities. In support of the objectives of this program and the long-term strategy for defense wastes, the following R&D activities are underway:

- A national strategy document is being prepared and will provide a comprehensive long-term plan for matching storage, processing and disposal methods. This plan is being developed with active participation from other Federal agencies, the States, industry, and the public.

- A multilaboratory program was formalized with a published plan in FY 1977 to improve the scientific basis for disposal methods. Criteria for operation of DOE low level waste sites are being finalized in FY 1980. Work is in progress on establishing a technical data file, site selection procedures, site operating practices, waste preparation requirements, and a systems analysis method to optimize procedures.

- Burial ground stabilization technology is being developed and some field tests are being conducted.

- Sites have been selected in an arid and a humid environment to begin field testing of improved shallow land burial technology in FY 1980.

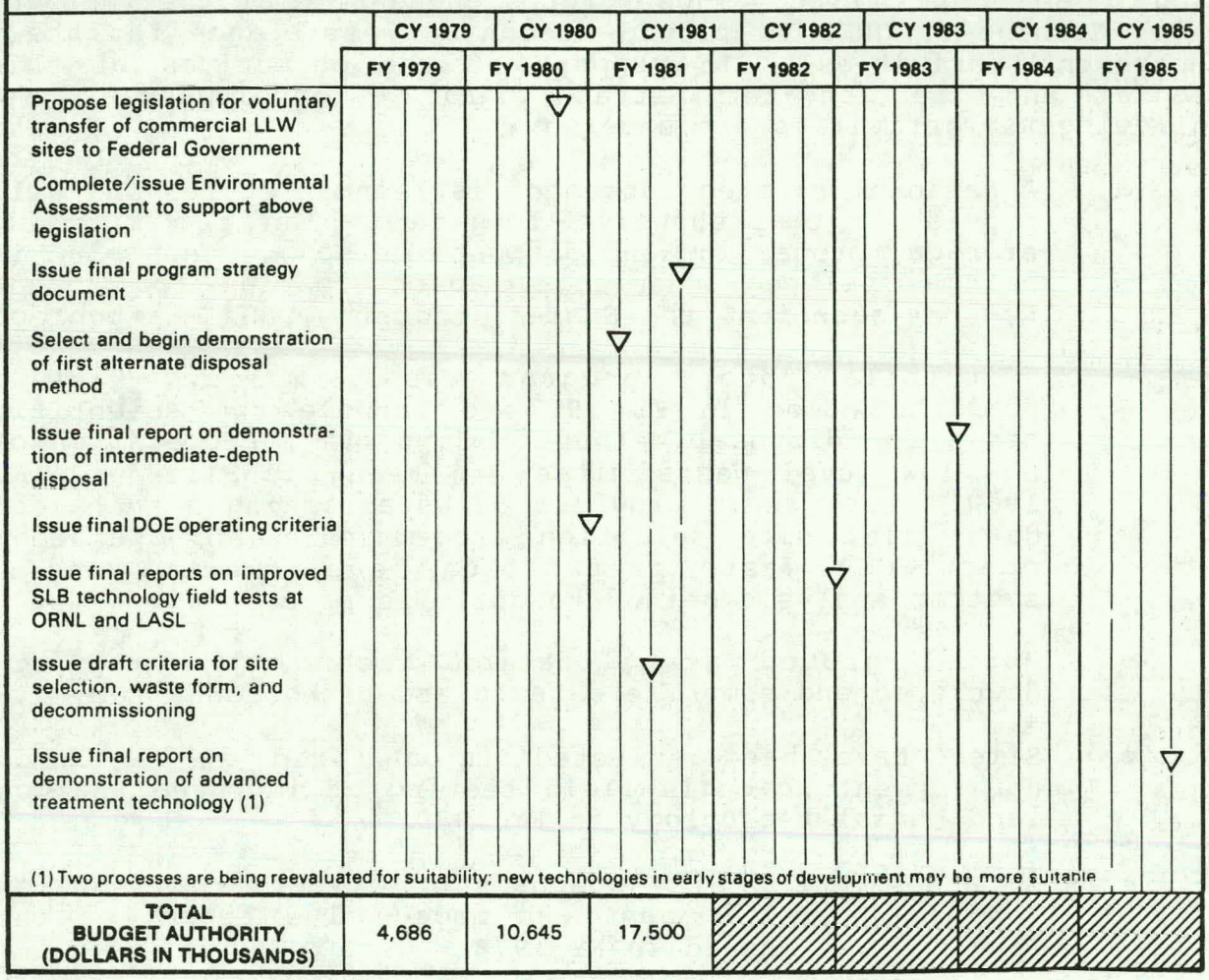
- An assessment of the adequacy of existing DOE shallow land burial sites has been made and a report on the findings was issued in FY 1978.

- At each disposal site, characterization of the geohydrological environment and the migration behavior of the wastes contained is underway. Based on the results of these studies, the stabilization requirements of each burial site will be established.

- A review is underway to evaluate alternatives to shallow land burial to provide disposal capability for a wide range of low-level wastes and geohydrologic environments. Promising alternatives will be selected for development and field testing. Demonstration of the first technique, intermediate-depth burial, will begin in 1981.

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY LONG-TERM WASTE MANAGEMENT TECHNOLOGY
TASK LOW-LEVEL WASTE

LEGEND: △ BEGIN MILESTONE; ▽ END MILESTONE; ○ DECISION MILESTONE; ▲ COMPLETED TASK



(1) Two processes are being reevaluated for suitability; new technologies in early stages of development may be more suitable

TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	4,686	10,645	17,500				

3.4 Transuranic Waste

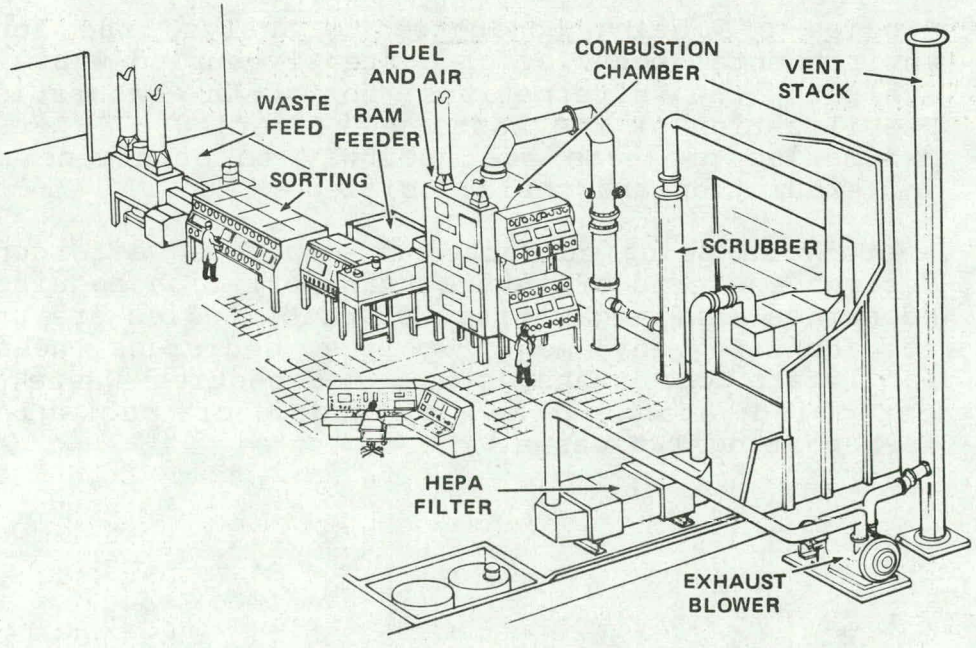
3.4.1 Transuranic Waste Management Technology

TRU-contaminated solid waste is a solid waste contaminated with long-lived TRU radionuclides. Most TRU nuclides show the unusual combination of physical properties of long half-life and high specific toxicity. The routine disposal of TRU solid waste at DOE sites by shallow land burial was stopped in 1970. Since then, the waste has been stored in a way that permits ready retrieval for a period of 20 years. This will allow access to the waste for further processing, if necessary, and ultimate permanent disposal.

Due to the special characteristics of TRU-contaminated solid waste, new technology is being developed for the safe handling, transportation, and disposal of this waste. The R&D programs established for TRU waste management have the following specific objectives:

- To develop technology for treating TRU waste to meet the criteria being developed for disposal
- To provide facilities and equipment for treatment, packaging, and transport of TRU waste to a Federal geologic repository

The objectives pertain to the disposition of three categories of TRU waste: previously buried waste, retrievably stored waste, and future wastes. One method of TRU waste incineration being investigated is shown below. This process is being developed to reduce substantially the volumes of TRU waste to facilitate packaging, transport, and disposal.



TRU Waste Incinerator — Conceptual Layout

Some previously buried waste may require exhumation. Each burial location for TRU waste or TRU-contaminated soil will be evaluated. Exhumation of previously buried TRU waste will be very carefully evaluated in future EIS's. The studies will analyze the environmental and occupational risks associated with exhumation versus the risks of leaving the TRU waste buried, as is presently the situation.

Status

The AL has been designated as lead organization for the TRU waste technology program.

In support of the objectives of this program and the overall strategy for defense wastes, numerous R&D efforts are underway, specifically:

- TRU waste technology is being developed, including volume reduction systems such as incineration, smelting, and electropolishing to remove contamination from metals; and immobilization of waste in various matrixes such as polymers, concrete, metals, and glass.

- Studies are being conducted to determine the facilities required for processing and packaging the retrievably stored TRU waste for geologic disposal. Conceptual designs will be prepared and evaluated for specific sites and central facilities.

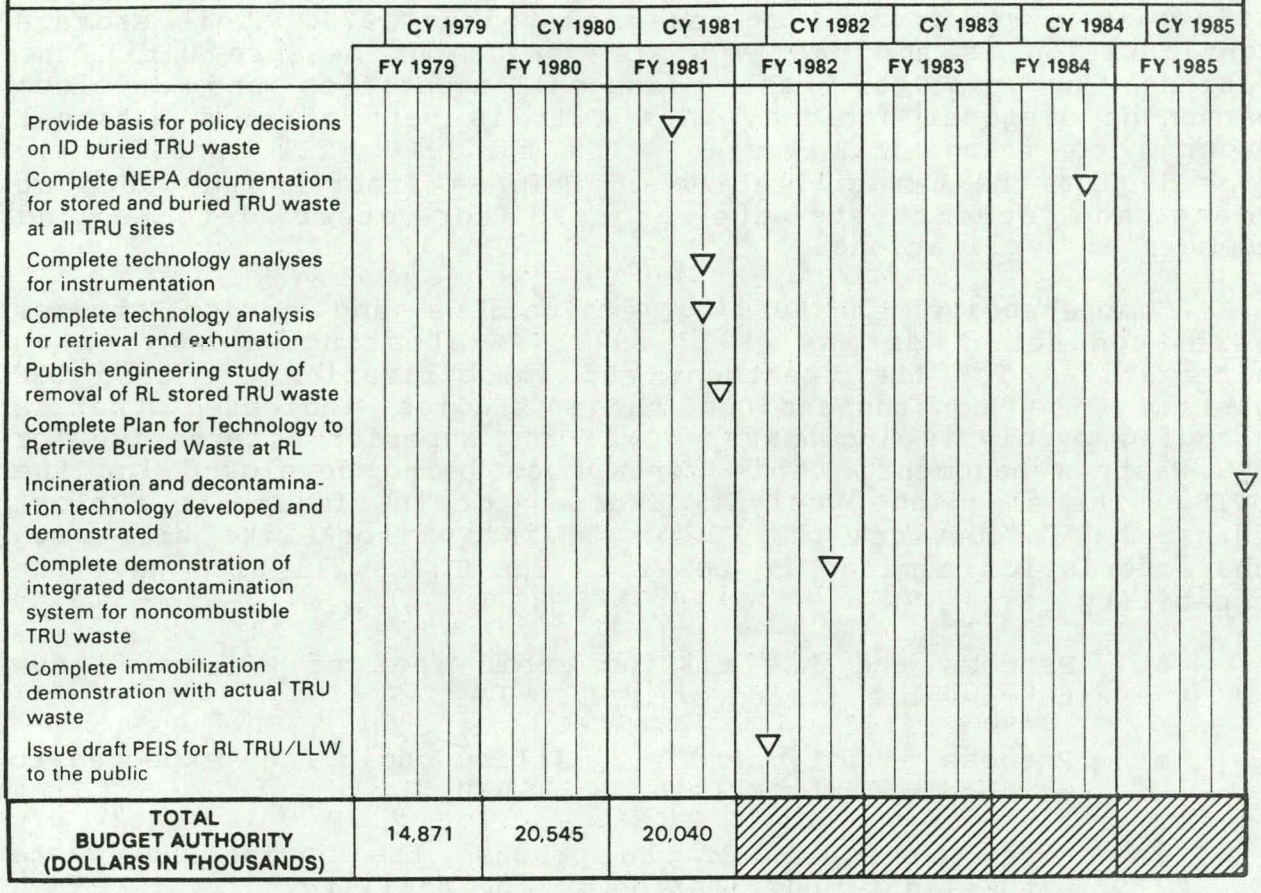
- A comprehensive plan is being prepared for retrieval and treatment as necessary for permanent disposal.

- Studies are being conducted to analyze the long-term environmental behavior of currently buried waste and to evaluate the alternatives for both exhumation and stabilization of the waste where buried. Experimental exhumation projects are underway to determine methods for exhumation and the associated risk.

- A study is being conducted to evaluate waste container designs in terms of future transportation requirements, economics, and regulations. Other studies are underway to identify any major policy decisions needed to facilitate the transport of radioactive waste and to establish standardized methods for packaging and transporting TRU waste.

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY LONG-TERM WASTE MANAGEMENT TECHNOLOGY
TASK TRANSURANIC WASTE

LEGEND:
△ BEGIN MILESTONE
▽ END MILESTONE
⬡ DECISION MILESTONE
▲ COMPLETED TASK



TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	14,871	20,545	20,040				

3.4.2 TRU Waste Treatment Facility (TWTF)

Transuranic waste has been shipped to the INEL for storage from the Rocky Flats Defense Plant in Colorado since 1954. This TRU waste together with the INEL generated TRU waste has been placed in a retrievable storage mode since 1970. This storage configuration is an interim waste management measure until the national program for waste disposal identifies and develops permanent disposal options. The TWTF is part of this National Program to manage TRU waste. The facility will specifically provide for the immobilization of Defense Program TRU waste at Idaho and demonstrate the process for other defense and commercial applications.

Comprehensive engineering evaluations and design studies were conducted during 1977-1979, evaluating the various alternatives for the treatment and immobilization of Idaho TRU waste. The conclusions of these studies indicated that a slagging pyrolysis incinnerator was the superior alternative for TRU waste management. This concept is being developed for the TWTF. The slagging pyrolysis incinerator is similar to a blast furnace. It converts the TRU waste into a rock-like slag with characteristics similar to besalt. The TWTF will also have the capability to:

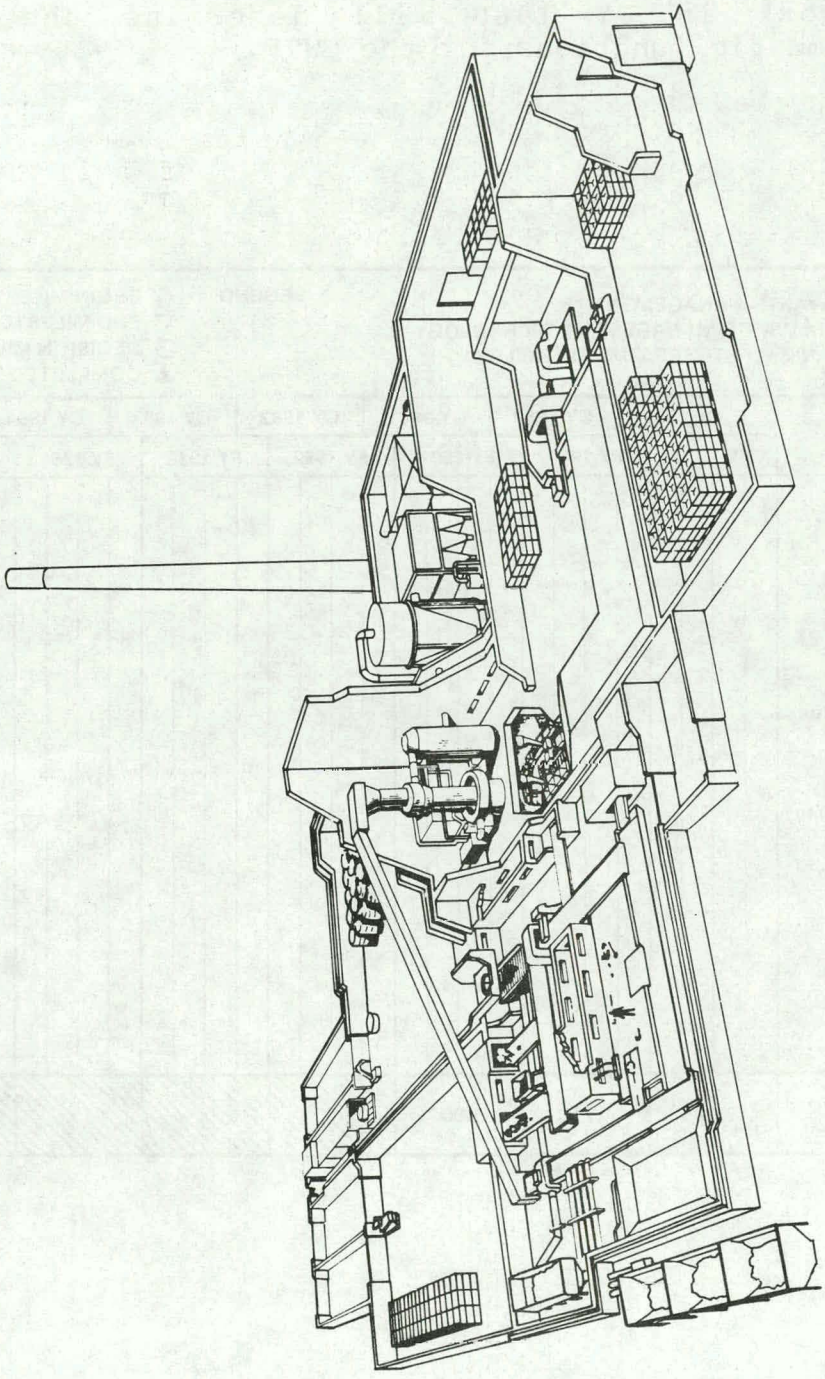
- Process the 1.3 million cubic feet of TRU waste now retrievable stored at INEL.
- Process an estimated 1.2 million cubic feet expected to be received at INEL through 1989.
- Have the capability to process the buried TRU waste with slight modification to the facility.

DOE in cooperation with Reedy Creek Utilities of Lake Buena Vista, Florida, is constructing a demonstration/pilot-plant slagging pyrolysis incinerator. This facility will be used to obtain design verification and performance data by conducting full-scale tests in a non-radiological environment.

Status

Engineering work to date has been directed toward selection of a processing/immobilizing alternative and designing the slagging pyrolysis incinerator for nuclear waste, specifically:

- Conceptual design of the TWTF using a slagging pyrolysis incinerator is complete.
- Title-I design studies for the facility began in FY 1979 and will continue through FY 1980.
- With the approval of a capital line item, Title-I design for the facility is expected to begin in FY 1982.



Transuranic Waste Treatment Facility

- Detailed design (Title-II) will start in FY 1983 and construction will begin FY 1985.
- EIS work in FY 1980 will determine the final programmatic functions for the TWTF.

ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY LONG-TERM WASTE MANAGEMENT TECHNOLOGY
TASK TRANSURANIC WASTE TREATMENT FACILITY

LEGEND: △ BEGIN MILESTONE; ▽ END MILESTONE; ⬡ DECISION MILESTONE; ▲ COMPLETED TASK

	CY 1979	CY 1980	CY 1981	CY 1982	CY 1983	CY 1984	CY 1985
	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985
TRU WASTE TREATMENT FACILITY*							
Under Secretary Approval to Start Title-II Design on TRU Waste Treatment Facility (TWTF)				▽			
Complete Startup and Initiate Testing on Reedy Creek Demonstration Plan				▽			
Assistant Secretary Approval to Start Construction on TWTF						▽	
Complete Title-II Design						▽	
Complete Construction on TWTF							3Q88 →
Start Production Operations at TWTF							4Q89 →
TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	2,385	4,710	5,000				

4.0 TERMINAL STORAGE

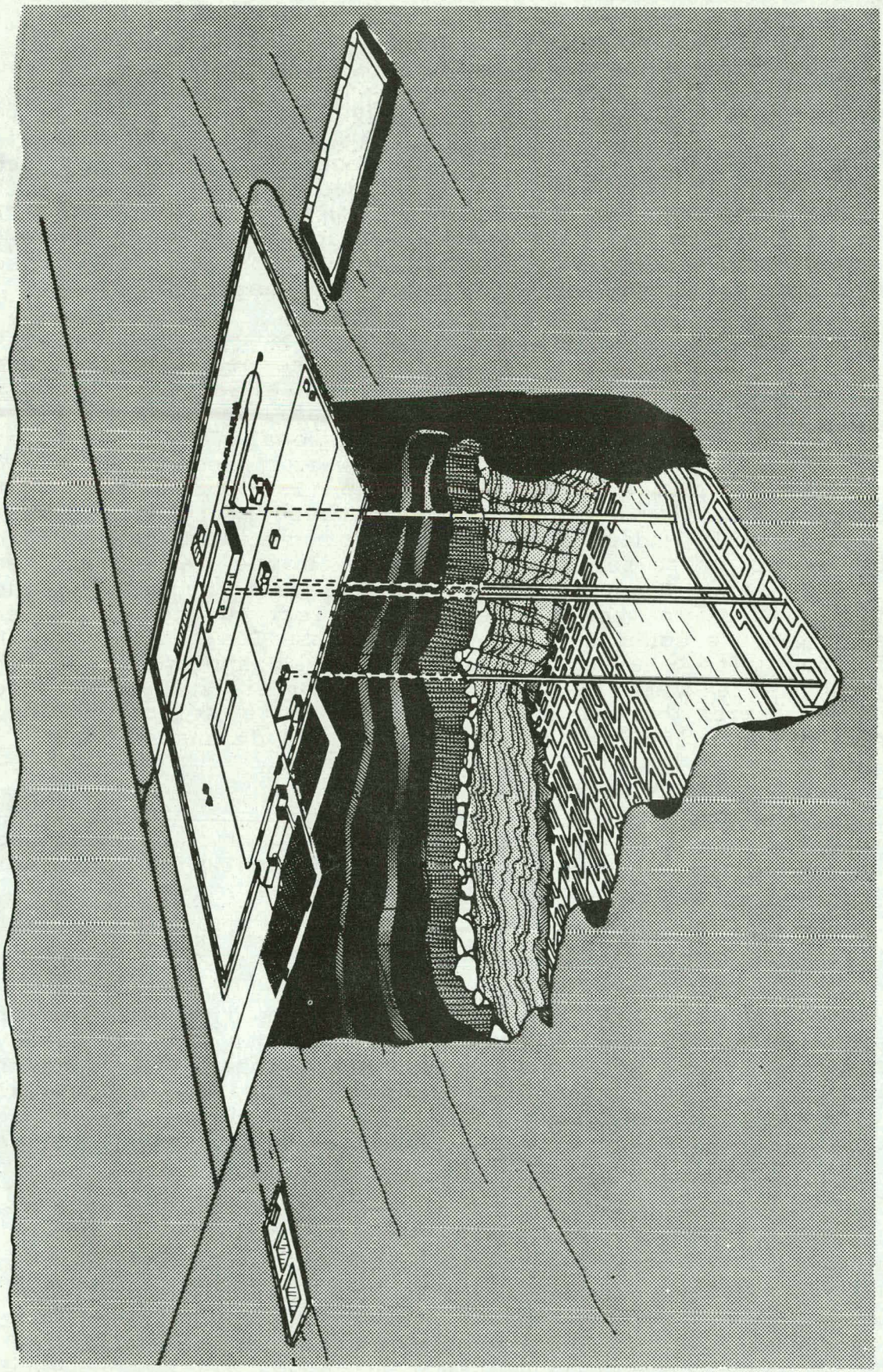
Major quantities of nuclear wastes have been produced as a consequence of the Government's production of plutonium for nuclear weapons over the last 35 years. All of the wastes having low levels of radioactivity were disposed of in shallow land burial grounds until 1970. It was decided at that time that the portion of these wastes contaminated with TRU elements (TRU waste) should be stored retrievably to facilitate later transfer to deep geologic disposal. The major function of the proposed WIPP facility was the disposal of these TRU wastes.

The President has decided that the Waste Isolation Pilot Plant (WIPP) project at the Los Mendos site near Carlsbad, New Mexico, should be canceled and that defense wastes previously intended to be disposed of in the WIPP facility will be placed instead in the first commercial waste disposal facility. These decisions were made following the review and recommendations of the President's Interagency Review Group (IRG) on Nuclear Waste Management concerning national nuclear waste management policy. Thus, no FY 1981 funding is requested for the WIPP construction project or for site-related activities in the defense nuclear waste programs. However, the Administration budget provides operating funds in the Commercial Nuclear Waste Management Program to ensure continued protection of the Los Mendos site and to continue site characterization work, as appropriate. The Los Mendos site will be compared with other fully qualified alternative sites before making a final site selection for a licensed disposal facility for commercial and defense wastes.

4.1 Waste Isolation Pilot Plant Research and Development

WIPP was the first proposed facility specifically designed for the long-term management of defense TRU-contaminated wastes. Numerous site qualification R&D activities were carried out to ensure a thorough understanding of the long-term behavior of the waste, the waste package, the disposal medium, and their interactions.

Various confirmatory R&D studies regarding the design of the proposed WIPP facility have been accomplished in the laboratory. However, laboratory tests and studies cannot totally simulate the actual conditions encountered at a repository site. Bench-scale R&D activities are underway and field/insitu (i.e., full-scale) R&D activities are planned to continue in the Commercial Nuclear Waste Management Program to ensure that no factors are overlooked.



The WIPP Repository

Status

Specific R&D studies and tests will continue under the commercial program in support of the designated WIPP site qualification. Technology development work is being conducted by Sandia Labs in the following major task categories:

- Geotechnical Site Evaluation
- Waste Characterization and Experimental Program
- Environmental Studies and Safety Analysis

A major portion of the first and third tasks has been completed, culminating respectively in the Geologic Characterization Report for WIPP, issued in September 1978, and the draft EIS, issued in April 1979 for public comment.

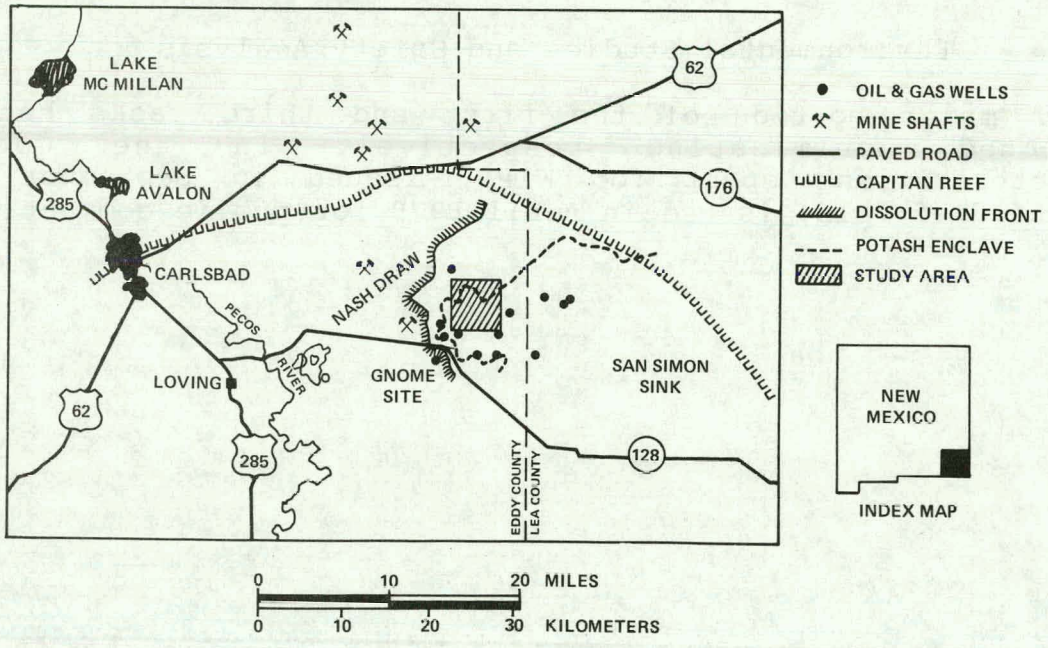
ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY TERMINAL STORAGE
TASK WASTE ISOLATION PILOT PLANT RESEARCH AND DEVELOPMENT

LEGEND: △ BEGIN MILESTONE; ▽ END MILESTONE; ⬡ DECISION MILESTONE; ▲ COMPLETED TASK

	CY 1979	CY 1980	CY 1981	CY 1982	CY 1983	CY 1984	CY 1985
	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985
Issue Summary Report on TRU Waste Characterization Studies	▲						
TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	18,319	6,440	0				

4.2 Waste Isolation Pilot Plant Facility

The Los Mendos site, which has been under consideration, is 25 miles southeast of Carlsbad, New Mexico, and would cover about 30 square miles (approximately 19,000 acres, most of which is Federal land). The current ownership of existing leases for oil, gas, or potash recovery has been identified. In cases where drilling operations by leaseholders were imminent, the leases have been acquired by the Federal Government to preserve the site integrity for potential use as a geologic repository.



Proposed WIPP Facility Site

DOE proposes to withdraw the land from the public domain and reserve it for DOE's purposes. Legislation transferring the land permanently to DOE would have to be sought from Congress if the Los Mendos site is selected as a repository location. The 1,760 acres owned by New Mexico would be purchased by the Federal Government via condemnation.

As proposed, the facility on the surface would cover approximately 112 acres and be serviced by truck and rail transportation. Access to this 112-acre surface area would be restricted to authorized personnel by chain-link fencing and

various security measures. Activities on the remaining surface area would also be subject to approval by DOE, but could be virtually unlimited. Any development of underground resources, however, would be under DOE's control to ensure that drilling or mining activities do not threaten the ability of the proposed repository to keep the waste isolated from man.

Waste disposal would be accomplished at a single level below ground in a bedded salt deposit. The wastes received at WIPP would be TRU wastes from the defense program, which do not give off significant heat. A maximum disposal area of 2,000 acres could be made available for those TRU wastes 2,300 feet below the surface. Wastes would be containerized and the containers could be handled directly (contact-handled wastes). The 4 million cubic feet of these wastes expected to accumulate by 1985 would occupy about 94 acres.

TRU wastes which must be shielded during handling (remote-handled wastes) would be deposited in a 20-acre area separate from those used for contact-handled (CH) wastes. One hundred thousand cubic feet of remote-handled (RH) wastes expected to accumulate by 1985 would occupy about 10 acres. If the current rate at which these materials are generated persists after 1985, one additional acre per year would be required.

Experiments with High-Level Defense Waste

A detailed understanding of the behavior of deep geologic deposits when subjected to conditions such as elevated radiation, thermal, and pressure stresses is necessary to continue the investigation of long-term HLW management options. Although various computer codes, design assumptions, and previously performed laboratory and bench-scale experiments have indicated the adequacy of geologic formations for HLW disposal, this work must be confirmed and validated by experiments in an actual geologic repository.

One purpose of the in situ experiments would be to simulate the long-term disposal environment by subjecting the area to conditions, such as higher temperatures, caused by the high-level defense wastes. This would provide confirmatory information on the usefulness of the computer codes and the validity of design assumptions and would provide guidelines for operating large-scale, permanent repositories for these wastes at other locations. These wastes would also require remote handling.

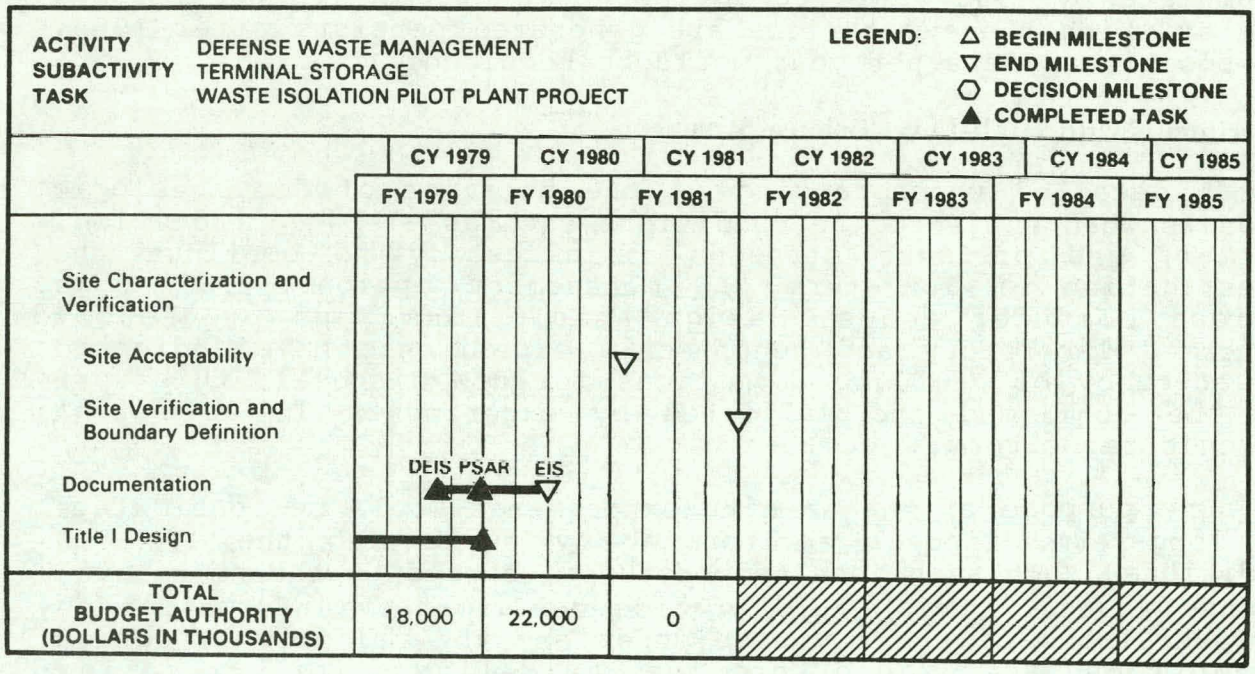
A 20-acre area could be devoted to these in situ R&D activities. All the material used in these R&D activities would be removed once the proposed experimental program was completed.

Status

The draft EIS was issued in April 1979. Public hearings were held in New Mexico and Texas during June and October 1979, to solicit public comment and to obtain public participation in the program. The public comment period closed on September 6, 1979, and a final EIS is in preparation and is scheduled for issuance during March 1980.

Title I preliminary design is complete for the WIPP facility and Title II design could start upon completion of the final EIS. The cost and schedule baselines have been established and the draft Safety Analysis Report (SAR) was issued in January 1980.

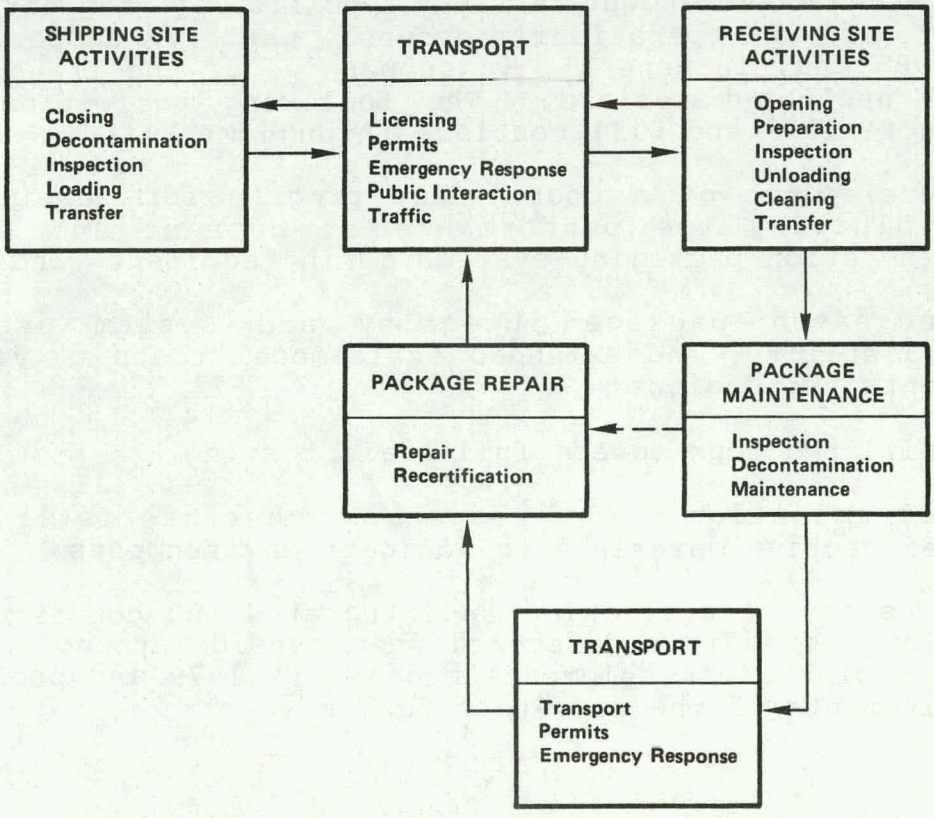
Although no budget request is being made for the WIPP facility in FY 1981, site qualification and development activities are proposed to continue under the Commercial Waste Management Terminal Isolation Program and the site would be reserved for potential future consideration as a repository for defense and commercial waste.



5.0 TRANSPORTATION RESEARCH AND DEVELOPMENT

The Defense Waste Transportation Program provides a balanced and integrated approach for the management of DOE's defense waste transportation activities and requirements. The FY 1981 work focuses on continuing development of equipment and systems to support DOE defense programs, continuing base technology for transporting all DOE wastes, and a major effort to meet DOE responsibilities in dealing with the concerns of the public, citizen organizations, and State and local governments. Development of conceptual design of high-level defense waste and processed CH-TRU transportation systems will be initiated and systems requirements for RH-TRU will be identified. Research will be conducted on cost-effective TRU waste transportation equipment, package integrity, system utility reliability, and vulnerability. Analysis and scale model testing will be conducted, and preparation for full-scale testing will be initiated.

The specific objective of this activity is to address problems of nuclear materials transport, meet DOE requirements, and support DOE programs. The scope of the activities includes institutional, operational, and technological transportation tasks.



Nuclear Material Transportation Network

The consolidation of DOE's ongoing and increasing activities in nuclear materials transportation initiated in FY 1979 must be strengthened to provide:

- An integrated systems approach to transportation operations, planning, and execution
- Technical management and consolidation of transportation R&D in support DOE programs
- A technology and information data bank
- Risk and environmental impact analyses
- Transportation factors input to waste acceptance criteria facility designs, handling hardware, and shipping systems
- Information to the public about waste transport, and achievement of societal acceptance
- Opportunities for public, industry, State and local government discussion, participation, and involvement

The systems development effort specifically supports the availability of an operational defense waste transportation system by 1986 and, in general, is supportive of the transportation of all nuclear materials. The following activities were initiated in FY 1979 and will continue through FY 1981:

- Development of a coordinated program for testing and evaluating the performance of current and future generation packaging systems during accident conditions
- Increased package integrity and system use and reliability, and extended scale-model tests to various container designs
- Initiated work toward full-scale testing
- Determination of response characteristics of radioactive materials to accident environments

The necessity of developing an integrated and comprehensive transportation system is underscored when consideration is given to the number of nuclear shipments made in FY 1979 and projected annual requirements of the near-term future.

Table III-3. FY 1979 Defense TRU and LLW Shipments

DEFENSE WASTE	NUMBER OF SHIPMENTS	VOLUME (FT^3)	ORIGIN	DESTINATION	MODE
CH-TRU	24	48,000	Rocky Flats, CO	Idaho	rail
CH-TRU	5	10,000	Mound, OH	Idaho	rail
TOTAL CH-TRU	29	58,000			
LLW	32	35,000	Argonne East, IL	Hanford, WA	truck
LLW	6	6,200	Firmi, IL	Barnwell, SC	truck
LLW	10	3,600	Ames, IA	Barnwell, SC	truck
LLW	1	900	Ames, IA	Hanford, WA	truck
LLW	4	6,500	Lovelace, NM	Beatty, NV	truck
LLW	25	34,500	Mound, OH	Barnwell, SC	truck
LLW	113	144,000	Rocky Flats, CO	Nevada Test Site	truck
LLW	32	12,000	Brookhaven, NY	Barnwell, SC	truck
TOTAL LLW	223	242,700			
NET	252	300,700			

Table III-4. Projected Shipments of Nuclear Waste

	ANNUAL PROJECTED REQUIREMENTS	ESTIMATED INITIAL OPERATION DATE
HLW	60 Cask Shipments	4Q 86
TRU		
RH	125 Truck and 100 Rail	85
CH	750 Truck Shipments	82
D&D	Significant But Exact Requirements Are Not Yet Known	

In response to these stated requirements, a Transportation Technology Center has been organized at SL under AL. The AL and SL are the lead organizations for this activity, but work will be carried out by industry, universities, and other DOE organizations.

In addition to defense waste transportation, DOE has continuing responsibilities in the transportation of nuclear materials which have direct application to the commercial sector. These responsibilities were highlighted in the Report to the President by the Interagency Review Group (IRG) on Nuclear Waste Management, dated March 1979. The findings and recommendations on transportation matters presented in this report state that DOE should:

- Conduct a program to test and evaluate the performance of current and future generation packaging systems during accident conditions
- Assist in development of a data bank on shipment statistics and accident experience to be operational by 1982
- Ensure early State participation in barge, rail, and highway route planning
- Study the benefits and associated costs of special trains for the shipment of nuclear materials
- Expand Federal assistance in developing the capability to handle emergencies

The technology and systems developed to transport existing and future inventories of defense-related nuclear waste will also facilitate developing the capability for moving nuclear materials associated with other activities such as the D&D of facilities.

The transportation program as set forth below addresses the requirements of the DOE and also acknowledges the responsibilities of DOE to support other activities.

- Development of certificated transportation systems and associated hardware for the shipment of DOE HLW from the SR, RL, and INEL facilities. The program includes assuring compatibility of the transportation systems with other DOE defense waste producers and receivers and commercial transport systems. This work will also yield supporting data for developing similar commercial transport systems. FY 1981 funding will complete the preliminary design, design test models for scale testing, initiate scale model fabrication, and upgrade the Safety Analysis for Packaging (SARP) and the Systems Design Description (SDD).

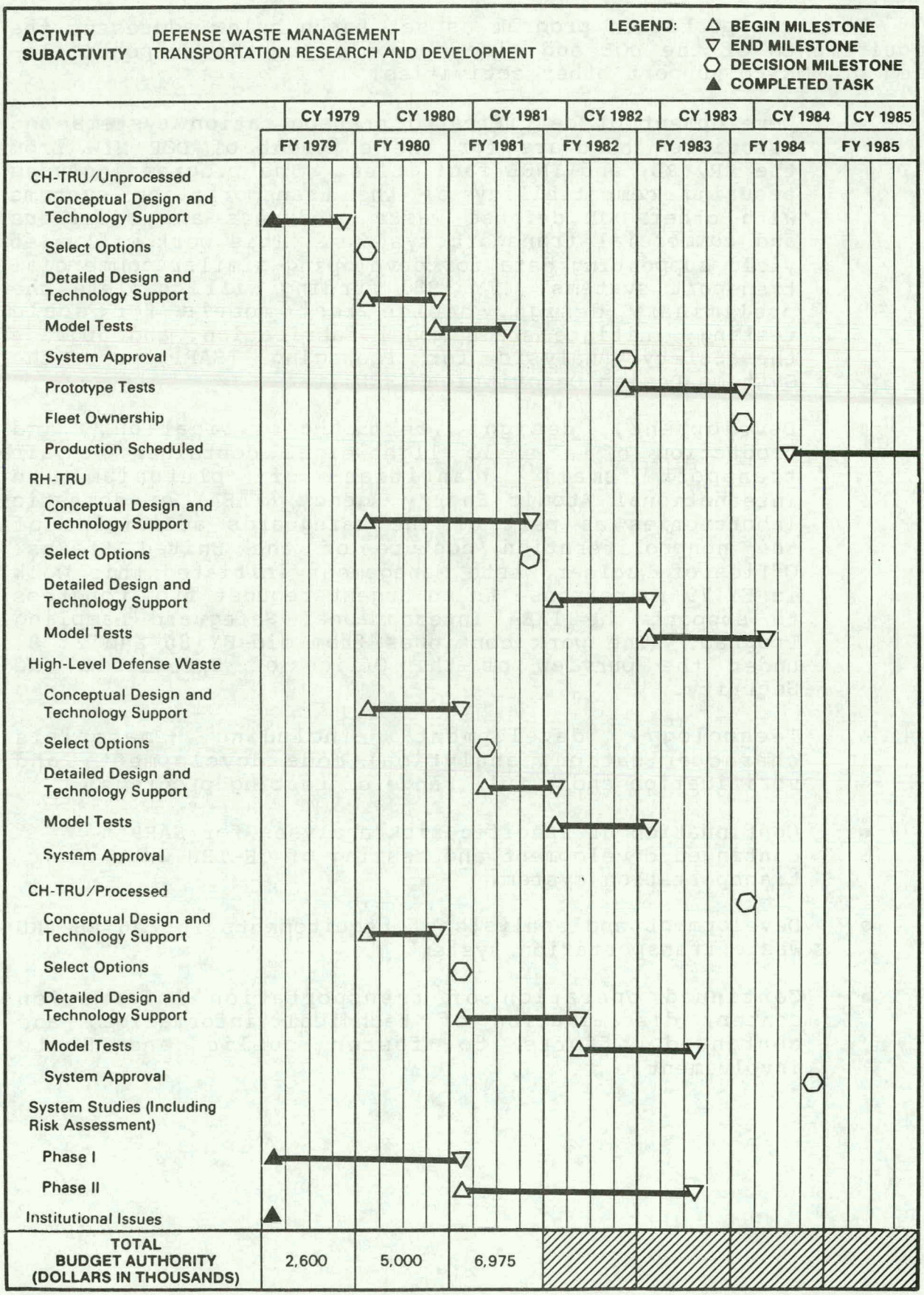
- Development, design, test, certification, and production of a small lightweight container to air transport small quantities of plutonium to International Atomic Energy Agency (IAEA) or domestic laboratories as part of the safeguards activities of the nonproliferation posture of the United States. Office of Nuclear Waste Management initiated this work in FY 79 in response to an urgent request from Congress to support the IAEA International Safeguard Sampling Program. The work continues from mid-FY 80 and FY 81 under the purview of the Office of Safeguards and Security.

- Technology development including materials characterization, analytical code development, and verification and a full range of testing programs.

- Continuation of specific risk analyses for SARP's continued development and testing of CH-TRU waste transportation system.

- Development and analysis of requirements for an RH-TRU waste transportation system.

- Continued operation of transportation information center, dissemination of technical information, and continued efforts to foster public and State involvement.


ACTIVITY DEFENSE WASTE MANAGEMENT
SUBACTIVITY TRANSPORTATION RESEARCH AND DEVELOPMENT
LEGEND:
BEGIN MILESTONE
END MILESTONE
DECISION MILESTONE
COMPLETED TASK
CY 1979
CY 1980
CY 1981
CY 1982
CY 1983
CY 1984
CY 1985
FY 1979
FY 1980
FY 1981
FY 1982
FY 1983
FY 1984
FY 1985
CH-TRU/Unprocessed
Conceptual Design and Technology Support
Select Options
Detailed Design and Technology Support
Model Tests
System Approval
Prototype Tests
Fleet Ownership
Production Scheduled
RH-TRU
Conceptual Design and Technology Support
Select Options
Detailed Design and Technology Support
Model Tests
High-Level Defense Waste
Conceptual Design and Technology Support
Select Options
Detailed Design and Technology Support
Model Tests
System Approval
CH-TRU/Processed
Conceptual Design and Technology Support
Select Options
Detailed Design and Technology Support
Model Tests
System Approval
System Studies (Including Risk Assessment)
Phase I
Phase II
Institutional Issues
TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)
2,600
5,000
6,975

B. COMMERCIAL NUCLEAR WASTE — COMMERCIAL WASTE MANAGEMENT

The DOE has the responsibility for providing facilities and developing the technology required for managing commercial radioactive wastes for which the Federal Government is responsible. In implementing this responsibility, DOE is currently faced with a major agency action--that of selecting appropriate technical strategies for the safe and environmentally sound isolation of all types of commercial radioactive wastes. The scope of the strategy consists of site investigations into candidate media, R&D into alternative treatment processes, and examination of alternative waste management technologies.

Budgetary classifications for the Commercial Waste Management Activity are structured under the following categories:

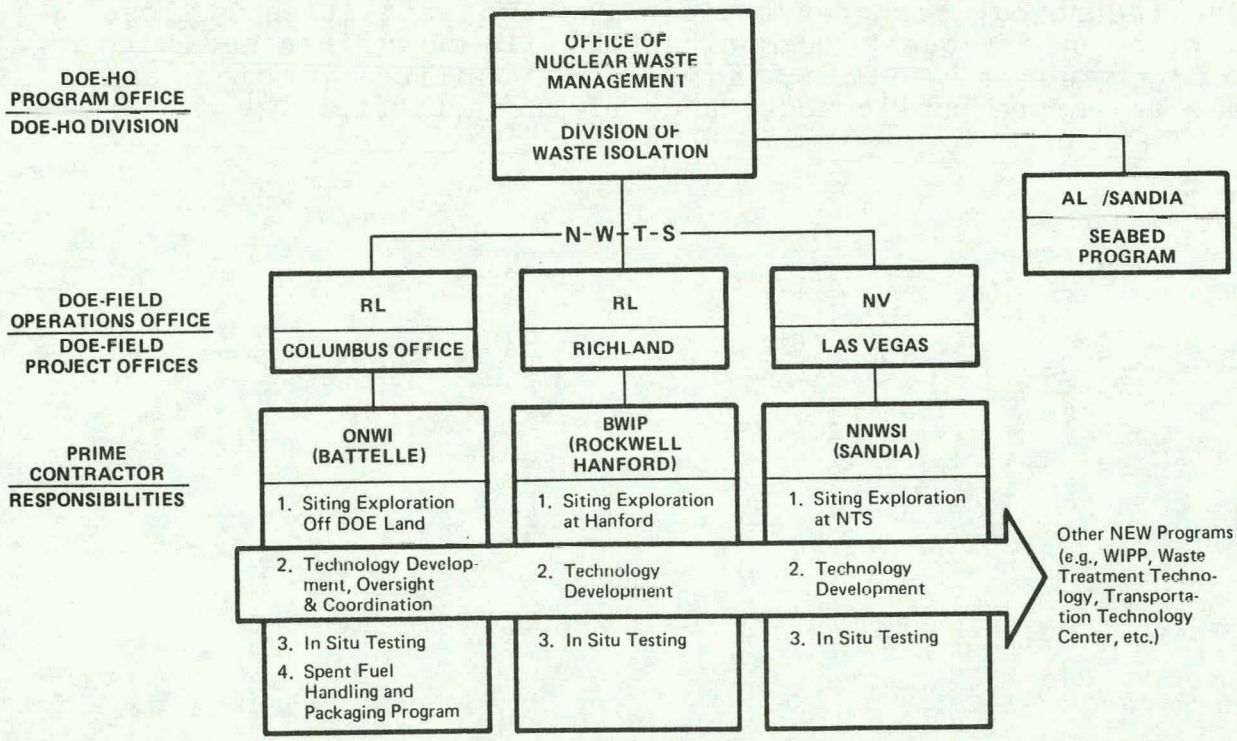
- Terminal Isolation Research and Development
- Waste Systems Evaluation and Interaction
- Waste Treatment Technology

All commercial waste management activities will maintain close coordination with relevant defense waste efforts to ensure effective technology transfer between the two activities. Close coordination and frequent communication will be maintained with appropriate Federal, State, and local public agencies and officials to ensure public acceptance of the activity.

1.0 TERMINAL ISOLATION RESEARCH AND DEVELOPMENT

The terminal isolation portion of the Commercial Waste Management Activity provides for the deep geologic disposal of the HLW's once they are in a suitable form and are appropriately packaged. Thus, this activity is directed primarily at the development of the facilities (repositories) which will provide the safe, long-term isolation of the waste from man's environment. The conditions under which this can be accomplished must be specified, sites meeting these conditions must be identified, and the development of the technology that will assure that the wastes will remain isolated must be completed.

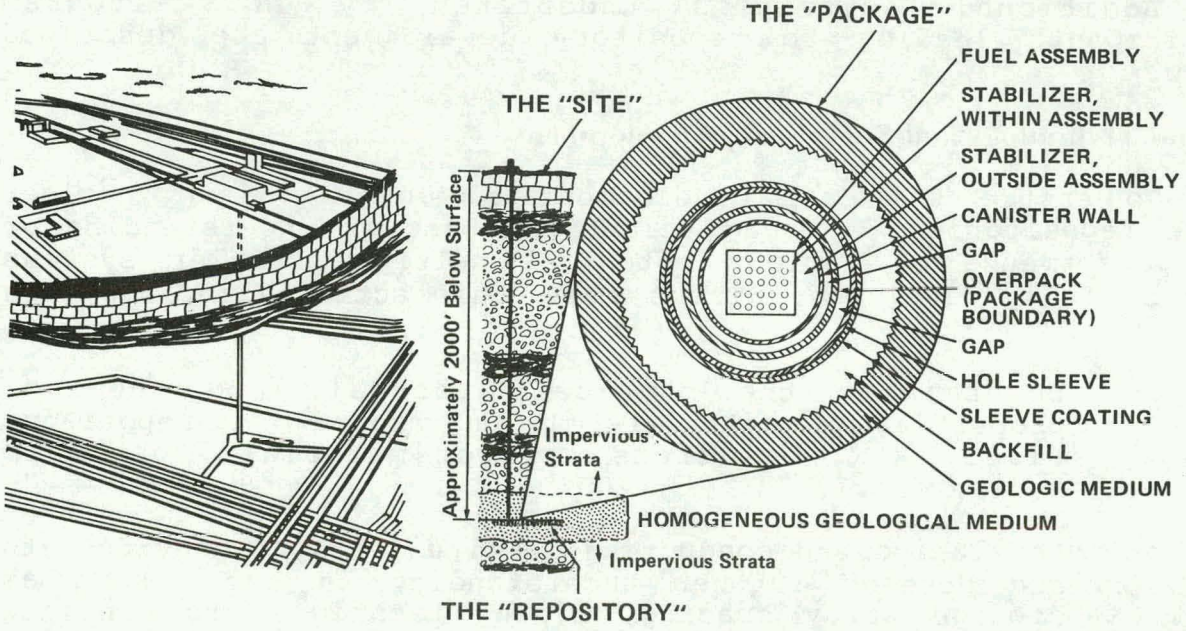
A major program for accomplishing these objectives, called the National Waste Terminal Storage (NWTS) Program, was initiated in late 1976 by a DOE predecessor organization, the Energy Research and Development Administration (ERDA). Today the NWTS program is comprised of three major elements, the Office of Nuclear Waste Isolation (ONWI), the Basalt Waste Isolation Project (BWIP), and the Nevada Nuclear Waste Storage Investigations (NNWSI). The specific responsibilities of these various NWTS elements and the overlying DOE Headquarters and Field Management Structures are shown in the following figure. Each of these efforts is described in more detail in the ensuing three sections. The end goals of these efforts are the identification of suitable repository sites and the start of repository construction in the mid- to late-1980's.



NWTS Organization

Battelle Memorial Institute, Columbus, Ohio, manages the ONWI program for DOE under the direction of DOE's colocated Columbus office of the Richland Operations Office. ONWI conducts technical activities in each of the general areas previously described. Each year, ONWI updates a Technical Program Plan, available to the public, which explains the purpose, scope, and timing for each of its activities in the context of the overall NWTS objectives. The BWIP and NNWSI program elements also produce Technical Project Plans on an annual basis which are available to the public. In addition, ONWI has a lead role in the development of overall NWTS plans and criteria, such as an Earth Sciences Technical Plan coordinated with the U.S. Geological Survey (USGS), a Quality Assurance Manual, a Repository Licensing Plan, a Repository Siting Plan, and Site Qualification Criteria.

The basic concept of deep geologic disposal utilizes a multi-barrier systems approach to isolation illustrated below. The system is comprised of combinations of engineered and natural barriers with each contributing to the overall ability of the system to positively assure the long-term isolation of the wastes. It is through this isolation that the safety and well-being of communities and their environment are assured for generations to come. To assure this isolation, the performance of each barrier over appropriate periods of time must be predicted or bounded under various natural conditions and postulated adverse conditions. These predictions derive from mathematical models which are developed and verified through laboratory and in situ test data.



The Multibarrier Concept for Terminal Isolation

In this regard, the NWTS Program elements participate in the following activities:

- Development and testing of safety assessment models and concepts to assess the safety of a repository, including disruptive event analysis and prediction based on natural and man-induced events.

- Development and testing of thermal analysis models to predict time-temperature distributions resulting from the radioactive wastes. Outputs include mechanical stress due to thermal expansion of the host rocks resulting from release of heat from radioactive wastes.

- Waste/rock/water interaction studies and tests to characterize the chemical, physical, geochemical, and radiochemical reactions and processes between emplaced radioactive waste, the surrounding rock, and the subterranean moisture.

- Development and testing of waste migration models to characterize the source term, model transport phenomena, and collect and evaluate transport data.

- Borehole plugging studies and experiments to establish the required technology to plug the exploratory boreholes and to seal off shafts of the decommissioned repository; development of plugging materials and techniques to measure performance and verification by field emplacement and testing.

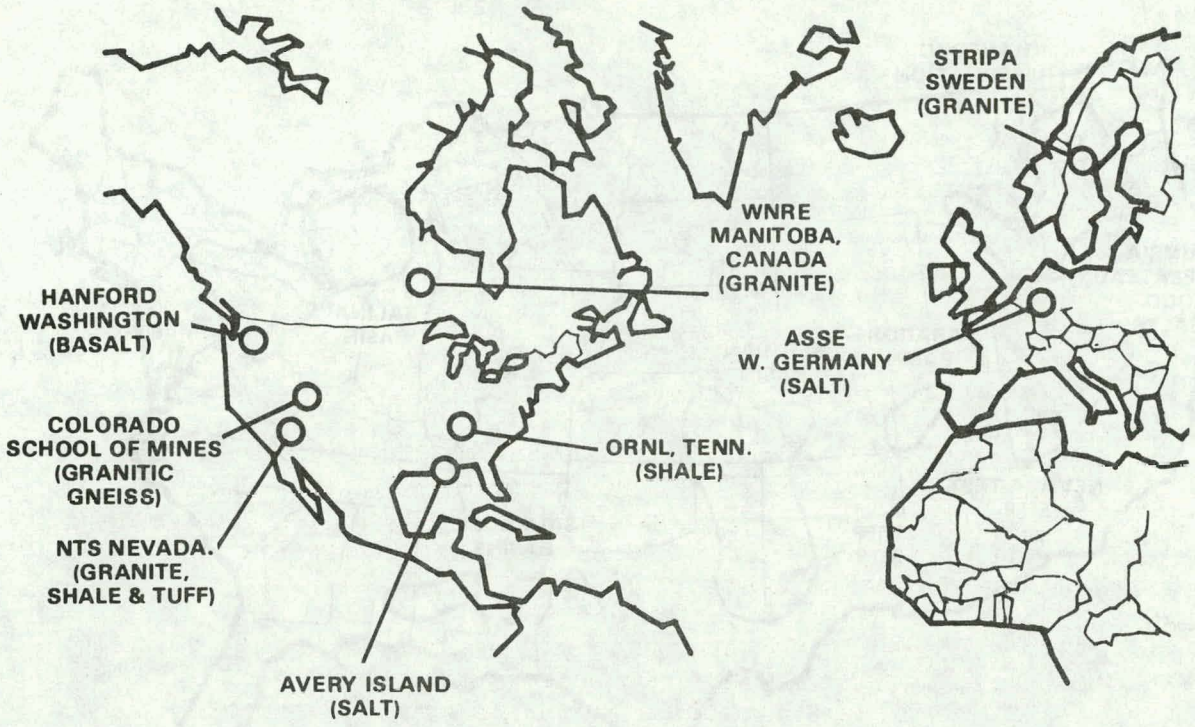
Additional activities undertaken by NWTS Program participants leading to repository development are described below.

General Technology and Engineering Development

To ensure the safe development and operation of nuclear waste repositories, a broad scientific base of understanding of the performance of various potential multiple barrier systems must be fully developed. Tasks under this activity include such items as:

- Determining the physical, thermal, and chemical properties of materials in and around the repository (i.e., HLW, canisters, system materials, geologic media, etc.).

- Developing and conducting in situ tests to provide data and develop further understanding in such areas as storage array spacing, mining techniques to minimize fractures, radiation effects on host rocks, borehole plugging, backfilling, waste retrieval, shaft sealing, engineered barriers, storage liners and plugs, isotopic



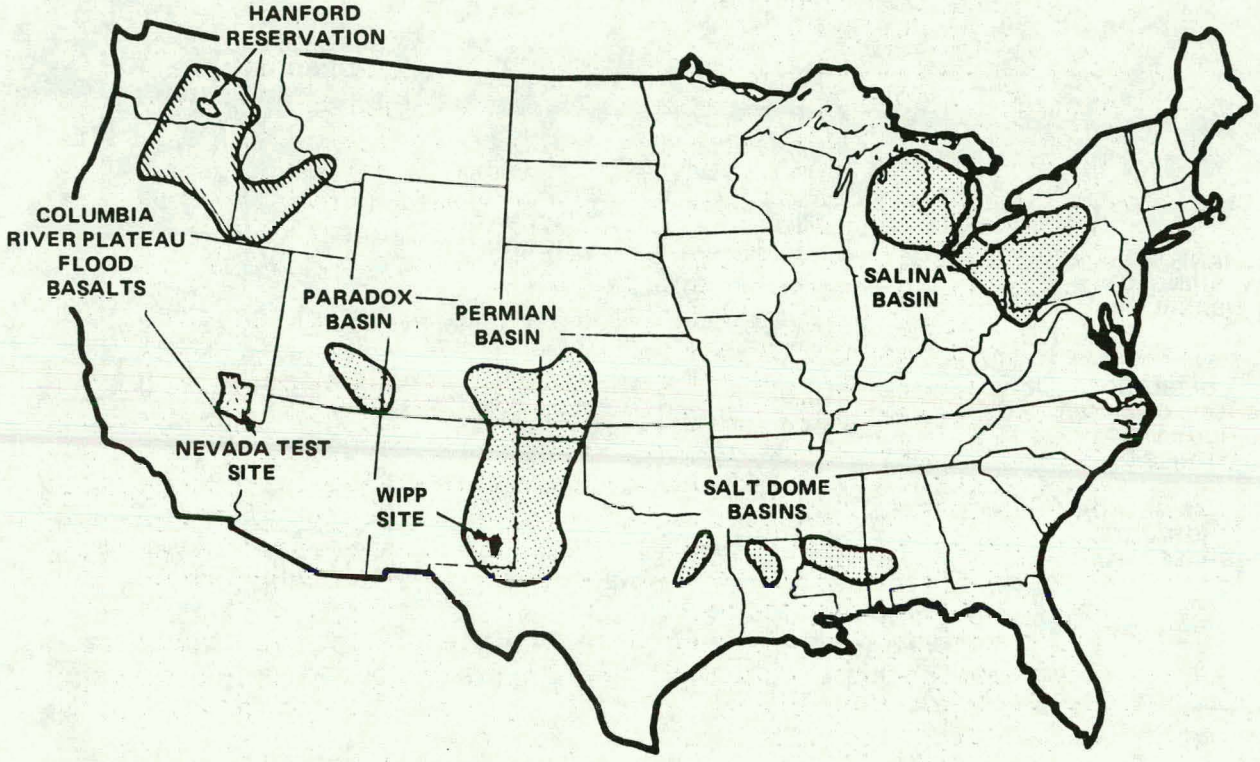
Where Are In Situ Tests Conducted?

dilution, and moisture migration in various geologies. In situ testing is being conducted at several locations in several countries, as shown below.

- Developing generic processes and equipment types. Certain processes, such as borehole plugging and nuclear materials handling, need better definition and field testing to support the licensing requirements for a repository. Similarly, certain equipment needs further developing to support repository applications.

Geologic Exploration (Siting)

The technical feasibility of deep geologic disposal must be established at specific sites. Accordingly, DOE places considerable emphasis on this task throughout the NWTS Program Elements. The primary objective of this task is to identify specific sites both on and off DOE land that can be demonstrated as having the characteristics appropriate for terminal isolation. Potential geologic systems are being screened and characterized on the basis of both technical geologic and hydrologic factors (the below-ground conditions) and environmental and socioeconomic factors (the above-ground conditions). Regions of intensive study at the present time are shown below.



Regions Studied or Now Under Study for Possible Terminal Storage of Radioactive Wastes

Geographically, screening is conducted by searching for those regions, areas, or sites having unique characteristics necessary to assure isolation. For example, one characteristic that has been shown useful as a screening guide because it is necessary for isolation yet only occurs in certain places, is the presence at some depth (typically 1,000 feet to 3,000 feet) of a suitable geologic medium or host rock. This host rock must also have appropriate dimensions and thermal, chemical, and structural properties. Historically, salt formations have been considered potentially suitable host rocks and have thus been used to guide siting efforts. More recently, granite (general crystalline rock, granodiorite, periodotite, and syenite), shale (general argillaceous rock), and basalt (gabbro and some tuffs) have been receiving much attention as additional potentially suitable host rocks. Additional geologic system features that are used to guide siting efforts are identified in Table III-5.

Table III-5. Geologic Criteria for High-Level Radioactive Waste Repository

Site Geometry	Adequate depth, thickness, and lateral extent of host media
Host-Rock Properties	Low permeability, porosity, and water content; adequate chemical, radiological, thermal, and physical and mechanical characteristics
Hydrology	Low groundwater gradients, adequate distance from utilization or discharge points
Tectonic Stability	Rates and amounts of uplift or subsidence cannot pose a threat to the physical integrity of the repository
Faulting	Located away from active faults which would adversely affect operational safety or geological containment
Volcanism	Cannot be sited in or near an area in which igneous or volcanic activity has occurred during the Quaternary period (present to 1-1/2 to 2 million years ago)
Seismicity	Must be located in regions expected to be remote from recorded or historic earthquakes of greater than "moderate" intensity
Relationship to Natural Resources	Located in area which will prevent preemptive utilization of potentially valuable resources

In addition to a first screening on the basis of the host rock, a "systems screening approach" will be started in FY 1980 in cooperation with the USGS. This approach, still in the planning stages, will be directed not so much at specific host rocks but more toward characteristics that are dependent on the total geologic environment, such as groundwater retention time and length of groundwater flow path. Consideration of non-geological characteristics, such as population, land use, and surface transportation, are also being incorporated into these studies at an earlier stage than had been used previously.

The evaluation of environmental and socioeconomic factors parallels the geologic activity. Baseline data encompassing all aspects of the total environment (terrestrial ecology, aquatic ecology, meteorology, geography, hydrology, water resources and use, land resources and use, demography, and societal, economic, aesthetic, and institutional, factors) are gathered.

At the end of each phase of both the geologic and environmental region area and site studies, draft reports are issued to program participants, State officials, and the general public for review and comment. On the basis of analysis in the reports and comments thereon and in consultations with the appropriate State officials, decisions are made concerning the detailed nature and timing of the subsequent, more detailed investigations.

Site Qualification and Repository Licensing

This activity involves the development of plans, criteria, safety and environmental analysis, and NWTS procedures leading to the licensing by NRC of a repository at specific sites. Major licensing activities will include developing and defending applications for repository siting, construction, operation, and decommissioning. Lacking precedent for these major interactions with NRC, this activity has major responsibilities for identifying the specific needs for new data, needs for new analytical techniques, quality assurance requirements, site qualification characteristics, etc., to be used throughout the NWTS program. In addition, this activity attempts to identify potential generic licensing issues that can be resolved prior to the first actual license applications and helps evaluation of proposed NRC licensing regulations issued for comment.

Waste Transportation

The objective of DOE's waste transportation task is to assure the timely availability and compatibility of all elements of the integrated transportation systems serving nuclear waste activities.

The technology developed and demonstrated to transport existing and future inventories of defense-related wastes will also be applicable to transportation methods and equipment for commercial wastes. Close coordination with the defense waste operation will ensure prompt and effective technology transfer.

Institutional problems are identical for commercial and defense wastes.

An integrated approach will be pursued by the Transportation Technology and Information Center (AL/Sandia) to include the following tasks:

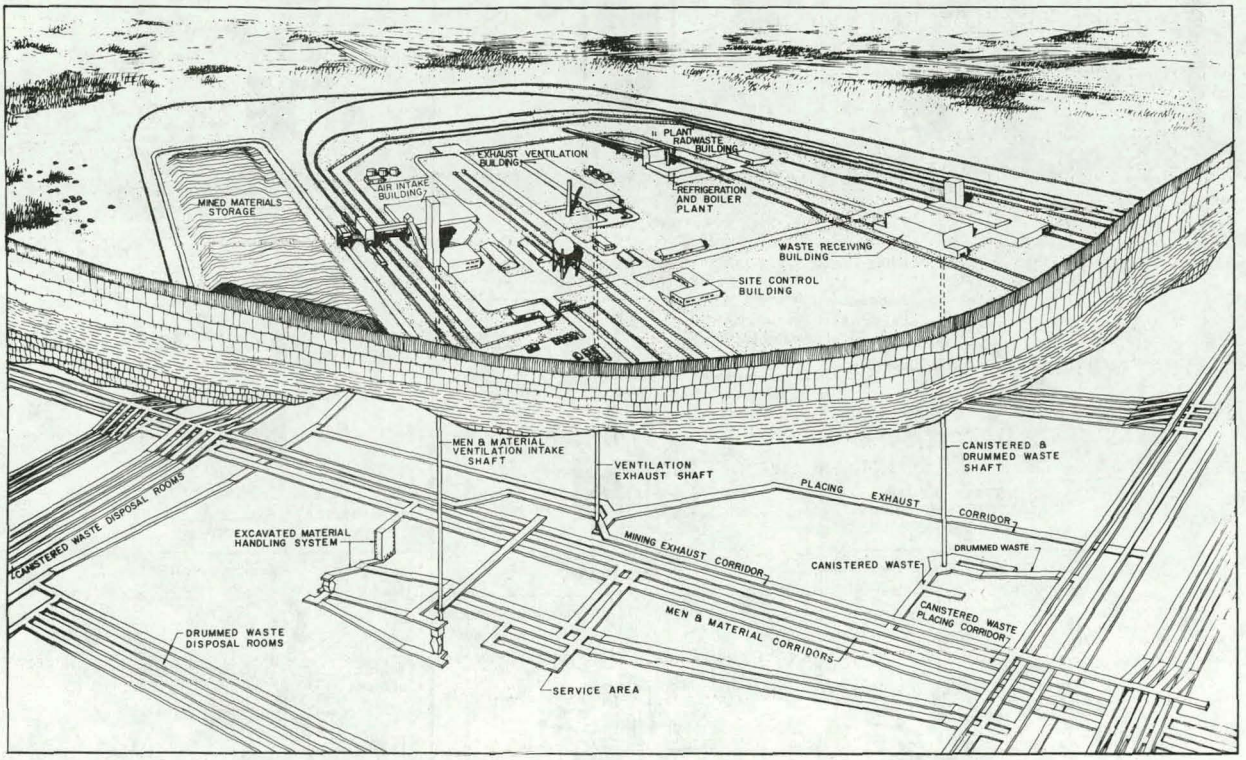
- A focal point for encouraging the development of transportation technology and industrial capability
- NWTS Test Program Transportation Support and Transportation Package Development
- Geologic Repository Transportation System Evaluations
- Geologic Repository Transportation Support
- Alternate Disposal Concepts Transportation Support

Waste Package Development and Design

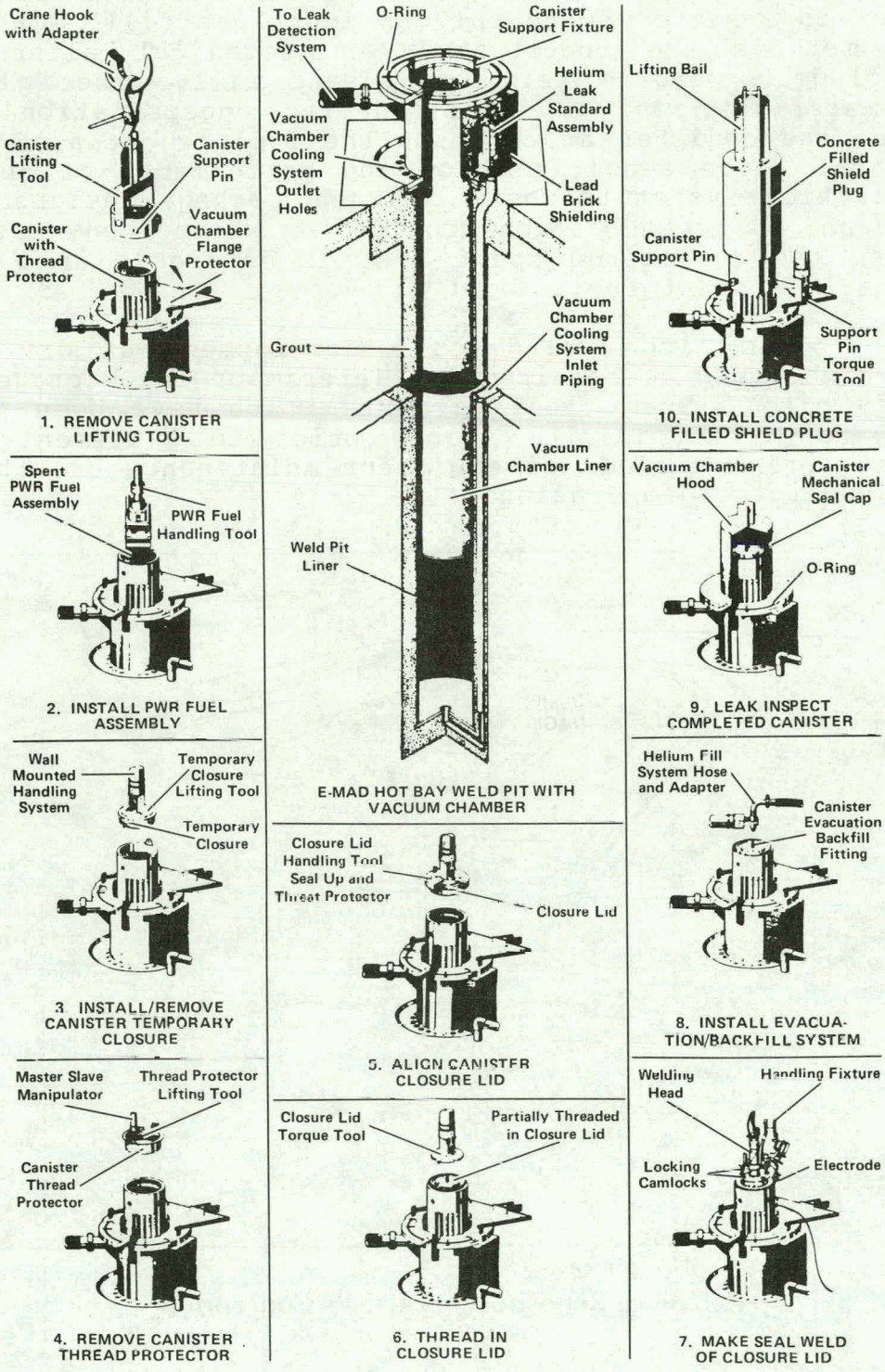
This activity is related to the development of waste packaging and storage systems designs and tests in preparation for emplacement in geologic repositories.

Several options exist for encapsulating the spent fuel. The baseline option illustrated in the following figure is sealing spent fuel in canisters with only an inert gas fill. Other more advanced methods are under study as technical alternatives. These include a metal matrix fill, sand fill, other glassy or ceramic materials, and multiple barrier encapsulation of the spent fuel and canister at the time the fuel is declared a waste for disposal. The sensitivity of the performance of the total waste isolation system to waste form and package designs will be evaluated and a recommendation provided on whether any waste form other than the canistered spent fuel is desirable as a package for disposal of spent fuel.

The program also includes the development of dry surface storage which would be required for interim or lag storage at the repository site. Spent fuel elements which have been packaged may need to be temporarily stored prior to placement in the repository during periods of equipment maintenance or other down times in underground operations.



Reference Repository — Artist's Conception



Possible Weld Pit Operations Sequence for Spent Fuel Packaging

Facilities Engineering

This activity involves the development and optimization of design configurations for repositories such as those shown below. These designs are necessary to develop cost estimates, repository deployment schedules, and to specify laboratory and in situ test data needs for engineering design. In addition, these conceptual designs serve as focal points for such efforts as testing safety assessment models, developing conceptual repository construction and operations plans, and specifying process and equipment development needs.

Systems Analysis

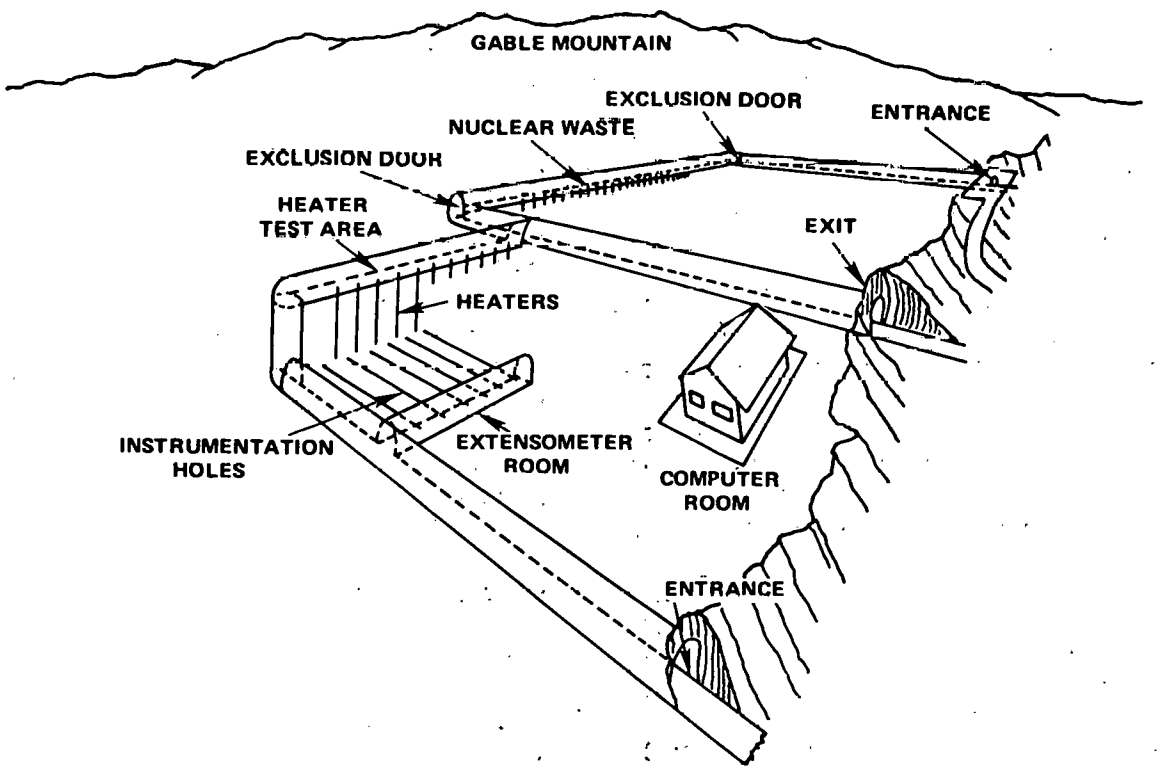
Activities in this area provide the capabilities to systematically assess, review, and coordinate the overall NWTS Program and to recommend appropriate actions. Broad problem areas relating to waste isolation are analyzed from an interdisciplinary standpoint.

1.1 Basalt Waste Isolation Program

This program has the prime responsibility for determining the suitability of DOE's Hanford Site, located in southeastern Washington, for terminal isolation. The geologic system of interest in this region is layered formations of basalt, a dense fine-grained rock formed by the solidification of lava.

Activities within this task include the following:

- Site evaluation to determine preliminary site suitability and to identify a specific suitable site for the potential location of a repository.
- Technology development and application specific to geologic systems involving basalt.
- In situ testing in an underground facility. The Near Surface Test Facility (NSTF), pictured below, will allow observation of thermomechanical and radiation-related effects to support the determination of the suitability of basalt as a repository medium and the design of a repository.
- Facility engineering in support of a basalt repository.



Conceptual Sketch for Near Surface Test Facility (In-Situ Testing)

Status

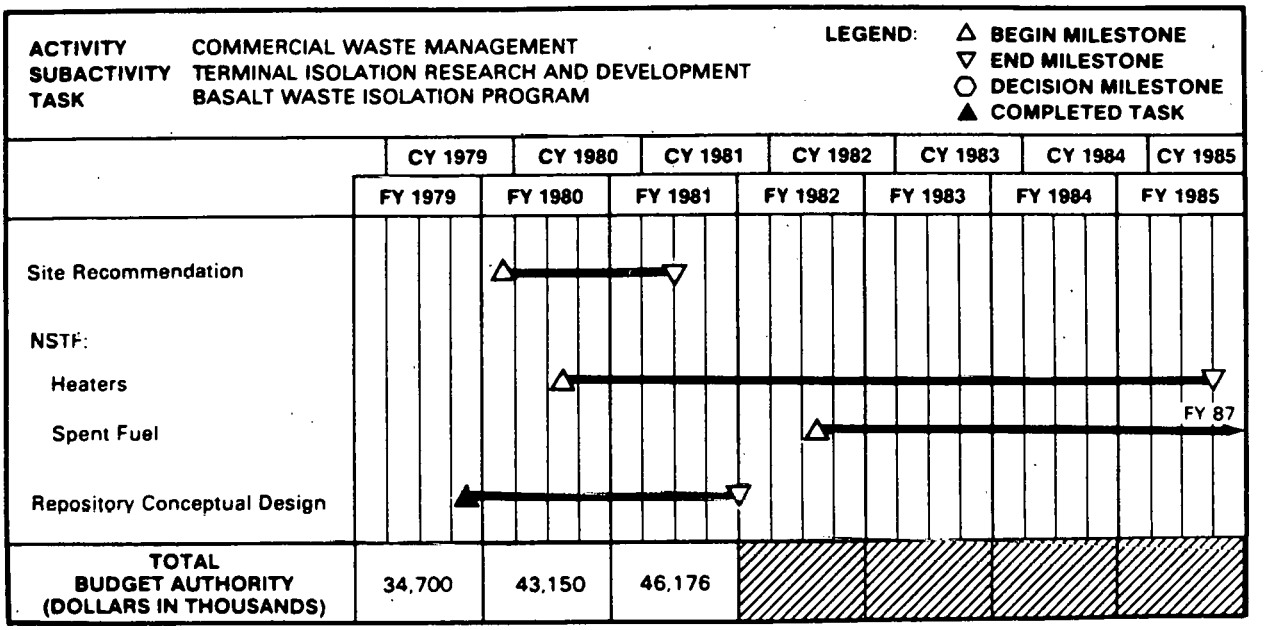
The lead management role of this program has been assigned to DOE's RL Operations Office. Rockwell Hanford Operations (RHO) (Rockwell International Corporation) at Richland, Washington, provides technical assistance for management activities.

Site evaluation will involve identification of several candidate sites by early FY 1980 and, possibly, identification of a suitable site by mid-FY 1981. Geologic investigations include a comprehensive drilling and testing program to provide subsurface geologic, geophysical, and hydrologic data; surveying and mapping; regional and local surface and groundwater flow systems and analytical modeling; and seismic monitoring. While these activities are focused on the Hanford Site, field work is underway off the Hanford Site to obtain data on the regional geologic and hydrologic settings.

In the technology development area, waste-rock interaction studies are continuing to study reactions, through laboratory experiments and analytical modeling, between the isolation media (basalt) and simulated waste forms (which include spent fuel, canister, and overpack materials) within a repository environment. Hot cell tests, using actual radioactive material, are scheduled to begin in FY 1982 to confirm and refine these preliminary studies. Borehole plugging studies are now focusing on identifying candidate materials and systems, and laboratory testing them. Field testing of the systems and materials is scheduled to begin in shallow boreholes on the Hanford Site by FY 1982.

NSTF design was initiated in early FY 1978. Construction (tunnel excavation into Gable Mountain) began in July 1978, and was completed 1 year later. The schedule calls for rock mechanics tests to begin in March 1980, heater testing to begin in June 1980, and nuclear waste loading to begin by May 1982. Spent fuel will be characterized, packaged, and shipped through support of the NTS Engine Maintenance and Disassembly (EMAD) facility. At this time, the emplacement of a canister of HLW glass (produced in the commercial nuclear waste vitrification demonstration) is being planned for NSTF also. The tests will run for approximately 5 years each, followed by the removal of test hardware (including spent fuel and nuclear waste).

In support of a decision concerning the engineering feasibility of a basalt repository, a preconceptual design of a repository in basalt was completed and an architectural/engineering (A/E) contractor was selected to perform conceptual design of a repository in late FY 1979. The A/E effort will also include engineering design studies to support various aspects of the repository project, such as licensing and the remote handling (RH) system. It is anticipated that the conceptual design will be completed by September 1981.

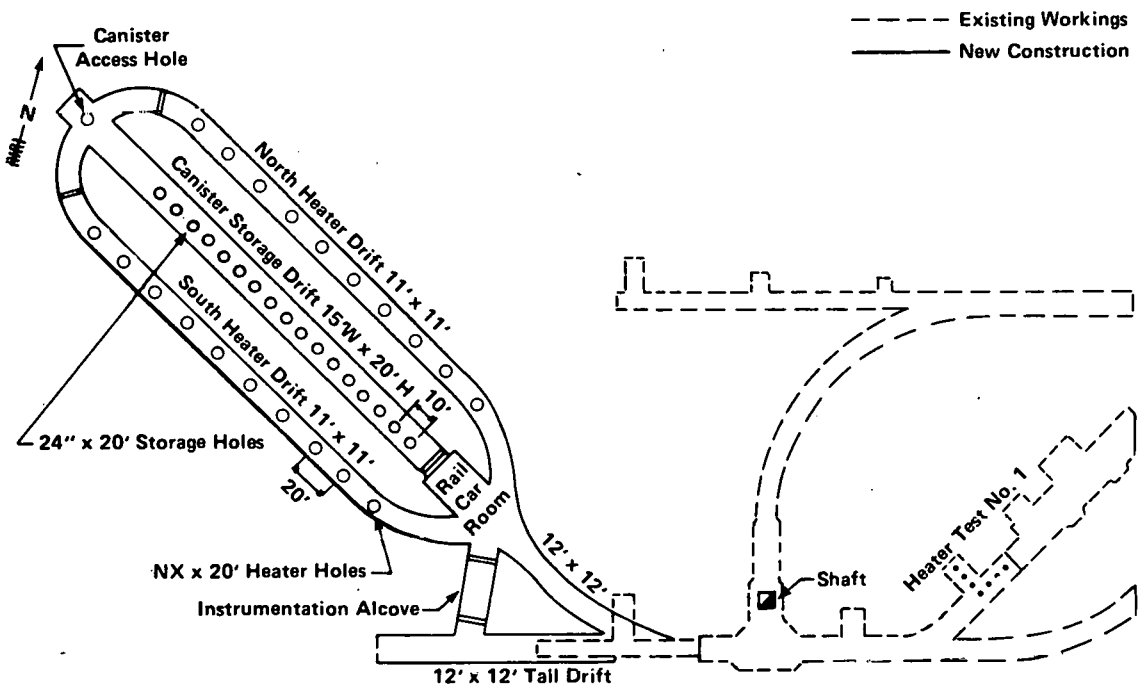

ACTIVITY COMMERCIAL WASTE MANAGEMENT
SUBACTIVITY TERMINAL ISOLATION RESEARCH AND DEVELOPMENT
TASK BASALT WASTE ISOLATION PROGRAM
LEGEND:
BEGIN MILESTONE
END MILESTONE
DECISION MILESTONE
COMPLETED TASK
CY 1979
CY 1980
CY 1981
CY 1982
CY 1983
CY 1984
CY 1985
FY 1979
FY 1980
FY 1981
FY 1982
FY 1983
FY 1984
FY 1985
Site Recommendation
NSTF:
Heaters
Spent Fuel
FY 87
Repository Conceptual Design
TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)
34,700
43,150
46,176

1.2. Nevada Terminal Waste Isolation Project

This project has the prime responsibility for determining the suitability of geologic systems at the NTS, located in southern Nevada, for terminal isolation. Unlike other areas of interest, this site provides varied geologic systems, allowing investigations to be performed in granite, argillite (a compact clay rock cemented by silica), and tuff (a sintered volcanic ash).

Activities within this task are as follows:

- Site evaluations to identify specific sites and suitable geologic media for the potential location of a repository
- Technical support to determine the characteristics of the available geologic media and weapons testing seismic effects
- In situ testing of thermomechanical and radiation effects in an underground facility, including the placement of encapsulated commercial spent fuel in the Climax Spent Fuel Test Facility pictured below



Climax Spent Fuel Test Facility

Status

DOE's Nevada Operations Office was assigned the lead management role. Sandia Laboratories at Albuquerque, New Mexico, was chosen to provide technical assistance.

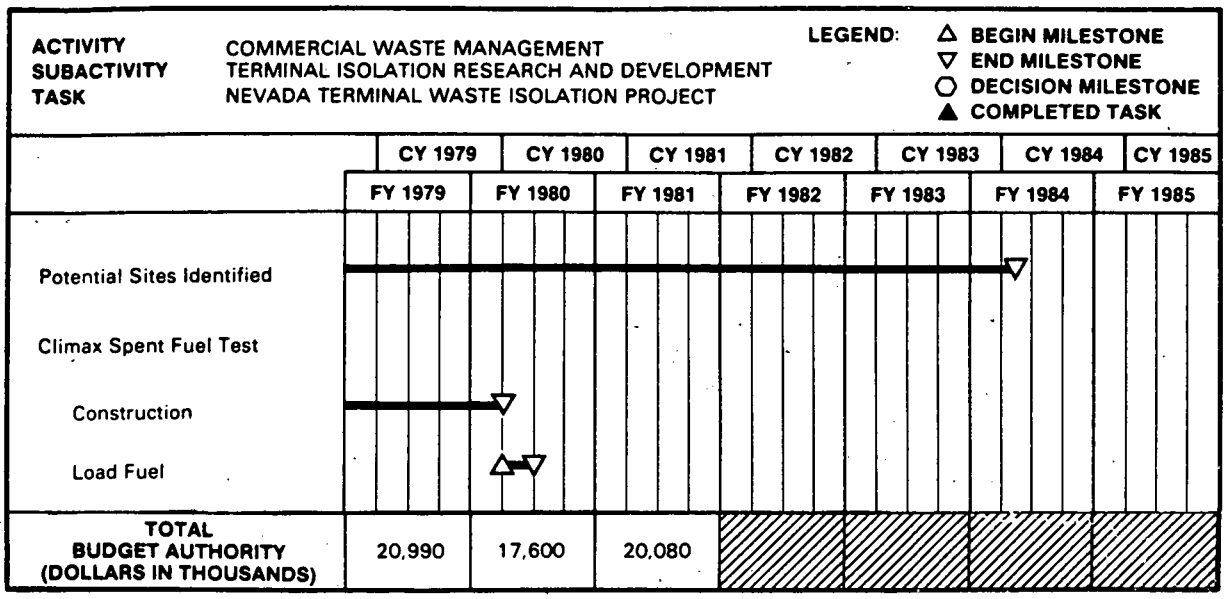
Having determined that no major impediments exist for locating a repository on NTS, site evaluations will continue to determine if a potential repository location exists. The site evaluations are restricted to the southwestern quadrant of NTS so that the site will be compatible with anticipated weapons-testing activities. Studies currently include geologic investigations to determine tectonics, stratigraphy, hydrology, natural seismicity, volcanism, and other characteristics. A number of sites on NTS have been considered for potential repository locations. Work on all but one site (Yucca Mountain) has been discontinued because questions concerning structural features indicated high probability for rejection. These sites have not been formally rejected pending review by a joint DOE-Nevada State panel that will establish the criteria (consistent with the generic NWTS siting criteria) for site suitability in Nevada. The area that remains under active consideration, Yucca Mountain, is a large tuff formation. Efforts will focus on investigating its suitability through a series of geologic and hydrologic test holes to be drilled in FY 1980 and FY 1981. A potential site in Yucca Mountain tuff could be identified as suitable in the 1984 time frame. Work is also continuing offsite in southern Nevada on locating promising formations.

In the area of technical support, radionuclide transport studies (by LASL) are continuing to evaluate the effectiveness of shale, granite, and tuff as waste migration barriers. Also seismic investigations including data processing and analysis, seismic monitoring (surface and subsurface), and ground motion repository design criteria studies to establish the potential effects of ground motion resulting from weapons testing at NTS are continuing.

Electrical heater tests were initiated in early FY 1978 in the Piledriver facility 1,400 feet deep in Climax stock granite. These tests, completed in mid-Calendar Year (CY) 1978, provided in-situ thermal property data and permeability data and verified the thermal analytical model. Electrical heater tests were run in 1979 in a shallow shale formation (Eleana) and are planned for early FY 1980 in a tuff formation.

Emplacement of commercial spent fuel for up to 5 years into an extension of the Climax granite facility is also being planned. Construction began in late FY 1978 and mining and driling was completed in June 1979; spent fuel loading is expected to begin in March 1980. The objectives of this test, in addition to those discussed for the NSTF spent fuel test, include

determining the response of granite to simulated repository operating conditions with actual radioactivity. Support for spent fuel acquisition, characterization, and packaging will be from the NTS EMAD facility.



1.3 Office of Nuclear Waste Isolation

The Office of Nuclear Waste Isolation (ONWI) has lead responsibilities in the NWTS structure for overseeing and coordinating generic NWTS technology development and for geologic exploration of DOE lands. The ONWI Program has evolved from previous programs which focused on systems centered on salt formations. Salt formations have historically received the most attention to date, stemming from a recommendation in 1957 by a subcommittee of the National Academy of Sciences (NAS) that salt formations could be an acceptable host rock. Following recommendations of the IRG, however, greater emphasis is being placed within the ONWI Program on investigative isolation systems involving alternate host rock media.

Status

ONWI's geologic exploration efforts have to date concentrated on the four regions shown on page 112 underlain by salt deposits previously identified as having high potential, technically, for eventual siting of a repository. These regions were the Salina Salt Region, which is a combination of the Appalachian and Michigan basins; the Paradox Basin; the Permian Basin; and the Gulf Coast Region (salt Dome Basin).

In the Salina Salt Region, the literature review phase was completed and areas for further evaluation were identified in Ohio and New York, but no field work was initiated and none is planned in the immediate future.

In the Paradox Basin, a regional reconnaissance was completed which identified three or four areas of interest. Field work, including drilling, was initiated in one of these areas in FY 1979 and is planned for two more areas in FY 1980.

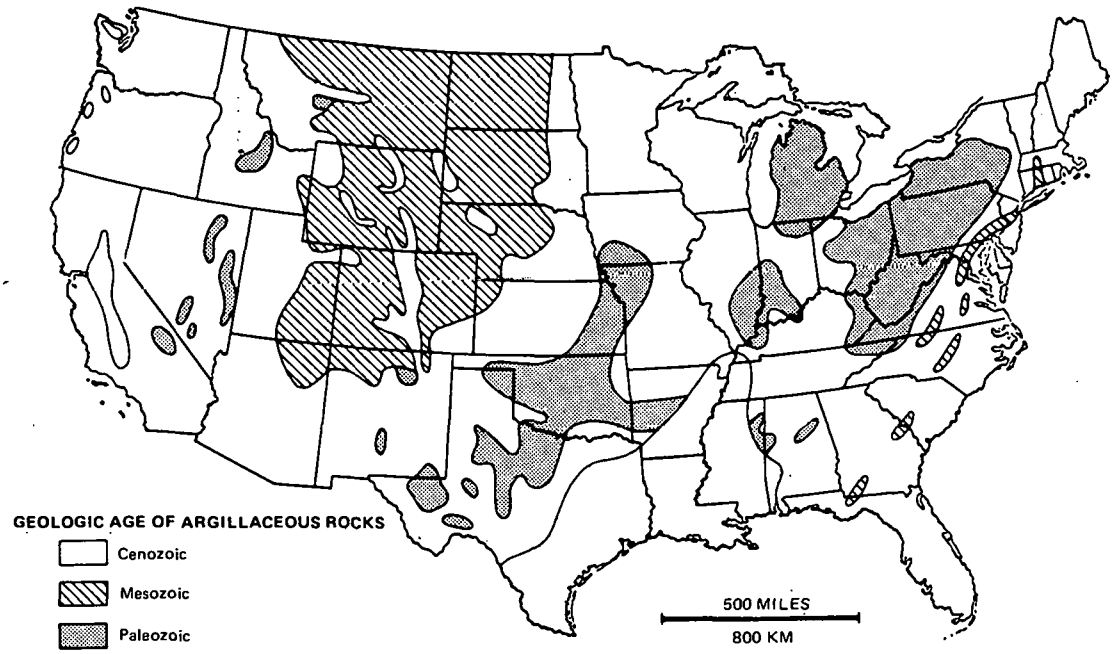
In the Permian Region, a thorough review of existing data was made to identify areas within the Palo Duro and Dalhart subbasins having significant potential for repository sites. Some field work was undertaken, primarily to establish a baseline on which to calibrate the existing data. It is anticipated that smaller areas having high potential and in which detailed characterization and evaluation can be undertaken will soon be identified.

Also in the Permian Region, the bedded salt investigations include continuation of the site characterization and qualification activities at the designated WIPP site near Carlsbad, New Mexico. These activities may include subsurface and surface experiments.

In the Gulf Coast Region a number of reviews of existing data by various organizations resulted in the identification of eight salt domes which were considered to have the highest potential for siting a repository. Further evaluation has

subsequently been undertaken on most of these eight domes. Work to date has resulted in the elimination of the Paleshae dome in East Texas because of uncertainties in its hydrologic stability as a result of previous solution mining activities. A second dome has been tentatively identified as having conflicting land use considerations and will probably also be lowered in priority. Of the remaining six domes, two or three will be identified in mid-FY 1980 as having the highest potential and will be recommended for intensive site-specific characterization and evaluation.

A national program in nonsalt rocks, initiated in FY 1979, is still well behind the effort in regions underlain by salt. In crystalline rocks several regions have been identified that are expected to be recommended for further evaluation and a similar effort is underway in argillaceous rocks. Shown below are extensive areas underlain by argillaceous rock units illustrating the potential for expanded siting investigations.



Map Showing Generalized Outline of Areas Underlain by Thick Argillaceous Rock Units in the United States

A third segment of the national effort is the national systems screening overview which will be conducted in close cooperation with the USGS. This overview will not be specific to any particular rock type and will concentrate on geologic characteristics that are related to the total geologic system rather than a specific host rock. Such characteristics will include groundwater retention time, groundwater flow path, and groundwater discharge patterns. Environmental and sociopolitical factors will be included in the characterization and evaluation.

Considerable momentum has also been achieved in the areas of general technology and engineering development. In the earth sciences field, the Savannah River Laboratory (SRL) is applying the measurement of certain accumulated decay products to determine groundwater age. The USGS is developing high-frequency electromagnetic borehole methods for use during the exploration, excavation, and monitoring phases of repository activity. Their research is answering some of the questions about borehole fluid effects by simulating a brine-filled borehole on an antenna range. The Lawrence Berkeley Laboratory is conducting laboratory studies to investigate the laws of fluid flow in fractures, the dependence of fracture conductivity on the size of the sample tested, and the thermal/mechanical properties of both intact and discontinuous samples of crystalline rocks. Tests have been performed on fractures artifically induced in intact samples of basalt, granite, marble, and other rocks.

The LASL is investigating the transport of uranium decay products and fission products at the Oklo site in Gabon, West Africa. The main activities of the program during the past year included (1) determination of transport zones around the Oklo natural fission reactors using lead 206, (2) study of ruthenium and technetium migration around the Oklo reactors, (3) development of a uranium-ruthenium age-dating technique, (4) a comparative uranium-lead and uranium-ruthenium chronologic study of the Cluff Lake uranium ore deposit, and (5) study of element migration paths around the Key Lake uranium ore deposits. Ruthenium and technetium appear to be moving distances of only meters over periods of time as long as 10^6 years, although the maximum distances to which these elements were transported remains to be determined.

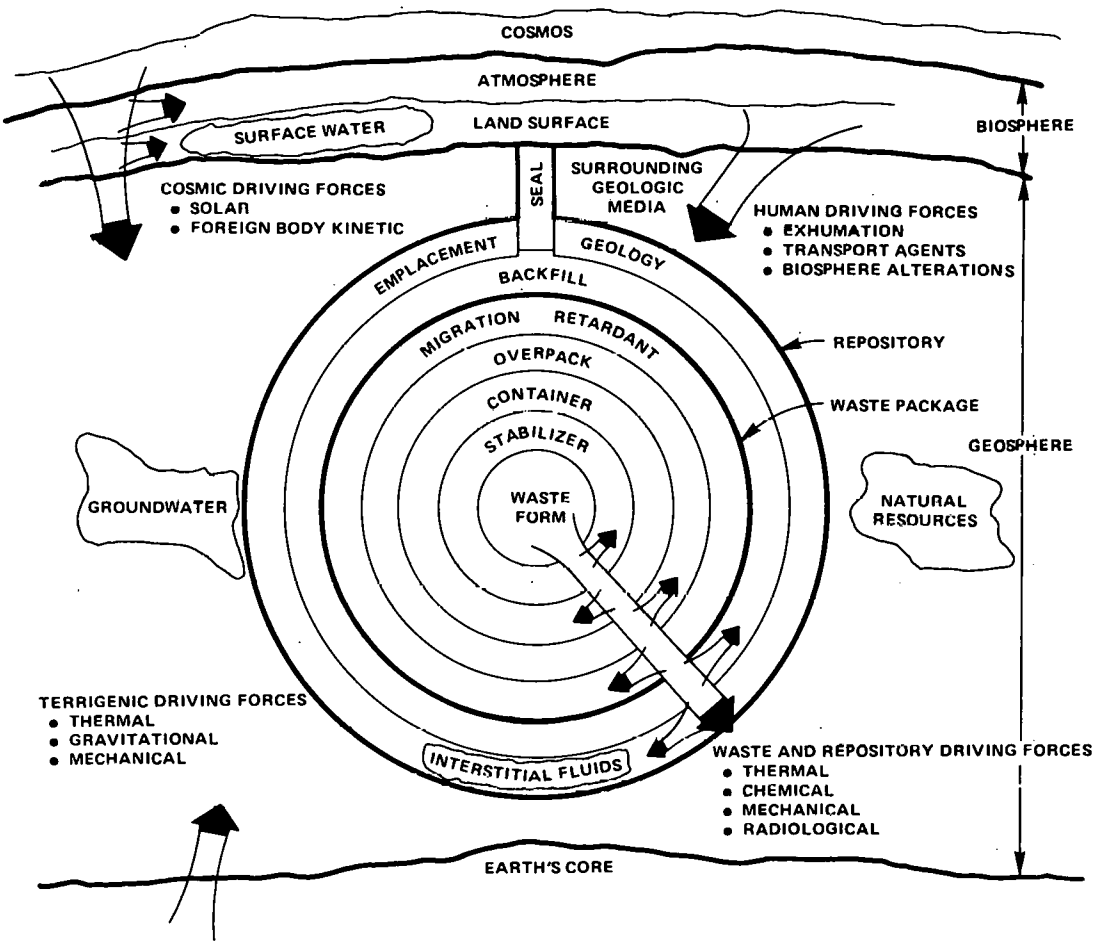
Georgia Institute of Technology has critically reviewed the data on the mineral and chemical alterations that occur during diagenesis and the low grade metamorphism of shale and other clay-rich rocks, and developed geothermometry methods to determine the thermal history of shales and to determine the geochemical, mineralogical, and structural changes which occurred in natural shales when they were subjected to burial temperatures in the range of 100°C to 400°C. Elastic, thermal, and permeability behavior of generic repository rocks at in situ conditions is being investigated by the Lawrence Livermore Laboratory (LLL). Laboratory measurements are being carried out on several generic rocks over a range of lithostatic pressures, deviatoric stresses, and temperatures to be expected near a waste repository.

Brine-waste interactions under mild hydrothermal conditions are being investigated at the Pennsylvania State University. The chemical reactions that might take place and the product of materials that could be formed in the event that containment is breached and waste comes into contact with fluids and wall rock are being determined. Results to date show that the chemistry of the fluid is of great importance and that the reaction behavior is quite different in groundwater and in a high magnesium

"bittern" brine. It has been shown that the bittern brine attacks spent fuel and glass at 200°C and supercalcine ceramic at 300°C with the effect that major amounts of numerous radionuclides are released into solution. The results indicate that for any of these waste forms such hydrothermal conditions should be avoided by lower thermal loadings of the waste and/or the repository or that these forms should be protected from contact with hydrothermal brines throughout the period of high temperatures.

The major analytic program for assessing repository performance under various conditions, the Waste Isolation Performance Assessment Program (WIPAP) illustrated below, has achieved several major goals over the last year. These included:

- An independent analysis of the WIPP site was completed for comparison with reference analysis.
- Sensitivity/parametric studies were completed for release consequence analysis.
- Work continued on model and code modification, development, extension, and coupling. The extension of the hydrologic model to include energy and solute transport (including fluid density variations) was completed.
- Development work was initiated in several areas of technology describing fluid flow in porous and fractured media.
- Data base development and operation continued for benefit of the test case analyses.



Waste Isolation Performance Assessment Problem

In the in situ testing area, field investigations at Stripa, Sweden, have produced a number of interesting results which cannot readily be explained by thermoelastic theory. For example, thermal expansion of the granite adjacent to the emplaced heater canisters is measured to be less than half that predicted for intact rock. At Stripa, three experiments have been underway for some time. The first is designed to study the short-term, near-field effects around an electrical heater simulating a full-size canister of reprocessed HLW. The second is a similar experiment designed to study the long-term nearfield effects. The third is a time-scaled experiment designed to simulate the interaction

between adjacent canisters over a period equivalent to about 2 decades. The results of all three experiments have been predicted in advance of the collection of field data.

Three in situ heater tests have been in operation within the Avery Island salt mine in Louisiana since June 1978. Preliminary conclusions concerning the heater tests do not show major deviations in the thermomechanical response of the Avery Island domal salt when compared with Project Salt Vault. Temperature measurements, however, have yielded data which indicate the in situ thermal conductivity is probably as much as 20 percent higher than the same property measured in the laboratory. Also at Avery Island a series of in situ brine migration experiments was initiated this year. The objectives of the experiments are to examine the movement of synthetic brine in salt in a temperature field induced by emplaced electrical heaters and to develop requisite and more precise measurement techniques and procedures for use in future natural brine migration experiments.

A test facility is being established at the Colorado School of Mines-Experimental Mine, located at Idaho Springs, Colorado, for the purpose of developing rock excavation procedures and site-selection/evaluation methodology which may be applied for siting and constructing repositories of crystalline rock. A test room is being excavated and a field research program undertaken to develop smooth-wall blasting techniques in hard rock which would be applicable to the excavation of canister and other drifts. The Colorado School of Mines-Experimental Mine will also provide the site for a thermomechanical test facility which is being developed.

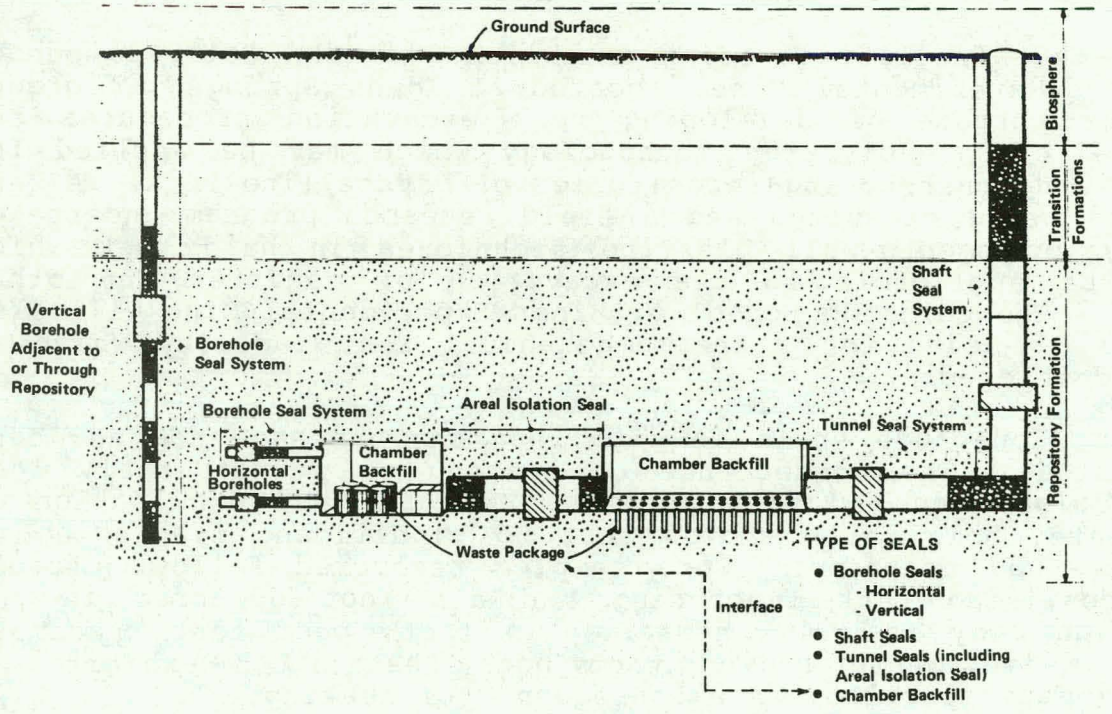
The Conasauga shale in situ test in Tennessee has now been terminated. The consequence of heating was considerably less spectacular than had been predicted. Post test examination of the heater hole walls showed that no significant fracturing or spalling had occurred. Core samples recovered following cool-down confirmed that fracturing had also not occurred in the formation away from the heater. In fact, post test transmissivity measurements showed that both test sites exhibited a decreased permeability as a consequence of heating.

A Salt Testing Facility is currently in the planning stage. Its in situ testing goals are model validation and reduction of uncertainty, determination of failure limits, and resolution of specific issues involving radioactive effects. Data from the tests will allow correlation of the various effects measured in offsite laboratories and in situ tests.

In the equipment development area, a major accomplishment has been the development and fabrication of a wireless telemetry system for in situ measurements. The system is comprised of an encapsulated battery-powered sensor package designed to be placed within a plug and a set of uphole electronics which control and communicate with the sensor package via a very low frequency

electromagnetic field transmission system. A successful integrated laboratory test was performed in February 1979, using the prototype electronics. The system will be calibrated and transported to the NTS where the underground system will be placed in the tunnel and the well head electronics with the surface antenna will be located on the mesa above.

In the area of repository sealing, a draft report was prepared presenting the first comprehensive design approach for repository seals (illustrated below). Geochemical investigations have also been initiated to address the factors which control longevity of plugging and sealing materials in a geochemical environment; and a borehole plugging field demonstration program is underway in southeast New Mexico, being conducted jointly by SL and ONWI, for the purpose of plugging drill holes on and near the proposed WIPP.



Schematic Illustration of Various Sealing Applications

Some major studies conducted under the systems analysis program during the past year included:

- A study to establish criteria by which waste packages, including the contained waste form, can be determined to be acceptable for handling and disposal at a deep-mined geologic repository.

- A systems Study on Engineered Barriers designed to develop a perspective on what benefit may be obtained by reduced leach rates, more durable containers, more increased sorption of nuclide ions. This benefit is measured in terms of incremental dose reduction due to improved barriers.

- An Ore Bodies Comparison Program which involves applying the above methodology to naturally occurring uranium ore deposits in order to develop a perspective on the potential dose consequences from ore deposits relative to those from a manmade repository.

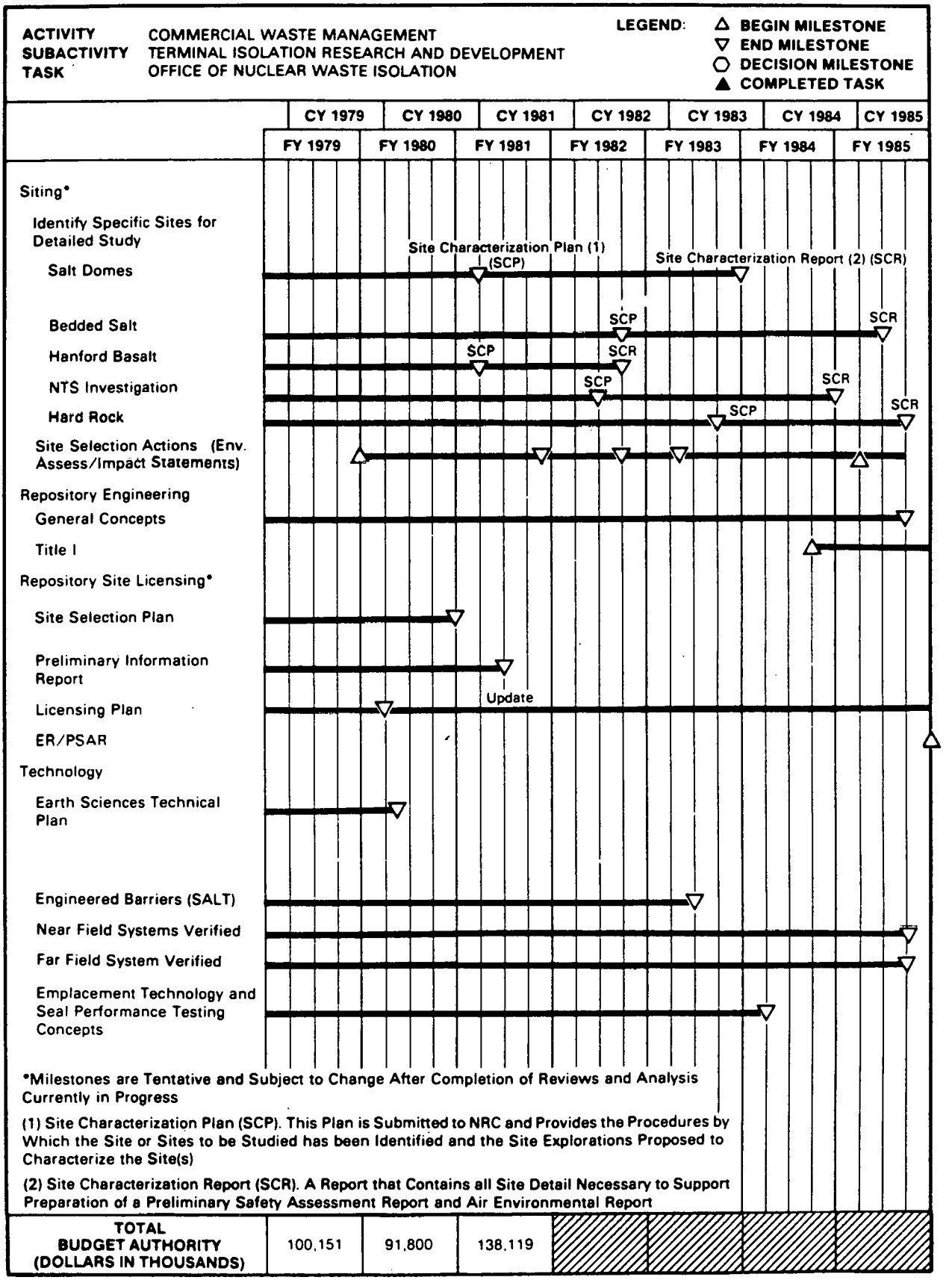
- A study to develop a scoping model of barrier performance, apply the model to a representative spectrum of designs, and perform estimates of incremental costs for development, manufacture, and emplacement relative to a baseline minimal package.

- An overview of the economics of terminal storage with the objective of illustrating cost and economic effects of program alternatives.

- A study to develop safeguards and security criteria for the waste isolation system.

In the area of site qualification and licensing, a significant part of the preparation for licensing is the preparation of the Preliminary Information Report (PIR). The PIR is a combined Preliminary Assessment Report and an environmental report (ER) prepared for a fictitious repository site which is a composite of information from several geographic locations, none of which could be used for an actual repository due to prior use conflicts. The PIR is expected to aid in early resolution of potential licensing issues.

Last, in the area of facilities engineering, conceptual designs initiated in January 1977 have been completed for a repository in domed salt for reprocessed radioactive waste and for a repository in bedded salt for unreprocessed spent fuel. Conceptual design provides defendable cost estimates, a head start on definitive design, and identification of R&D needs.



*Milestones are Tentative and Subject to Change After Completion of Reviews and Analysis Currently in Progress

(1) Site Characterization Plan (SCP). This Plan is Submitted to NRC and Provides the Procedures by Which the Site or Sites to be Studied has been Identified and the Site Explorations Proposed to Characterize the Site(s)

(2) Site Characterization Report (SCR). A Report that Contains all Site Detail Necessary to Support Preparation of a Preliminary Safety Assessment Report and Air Environmental Report

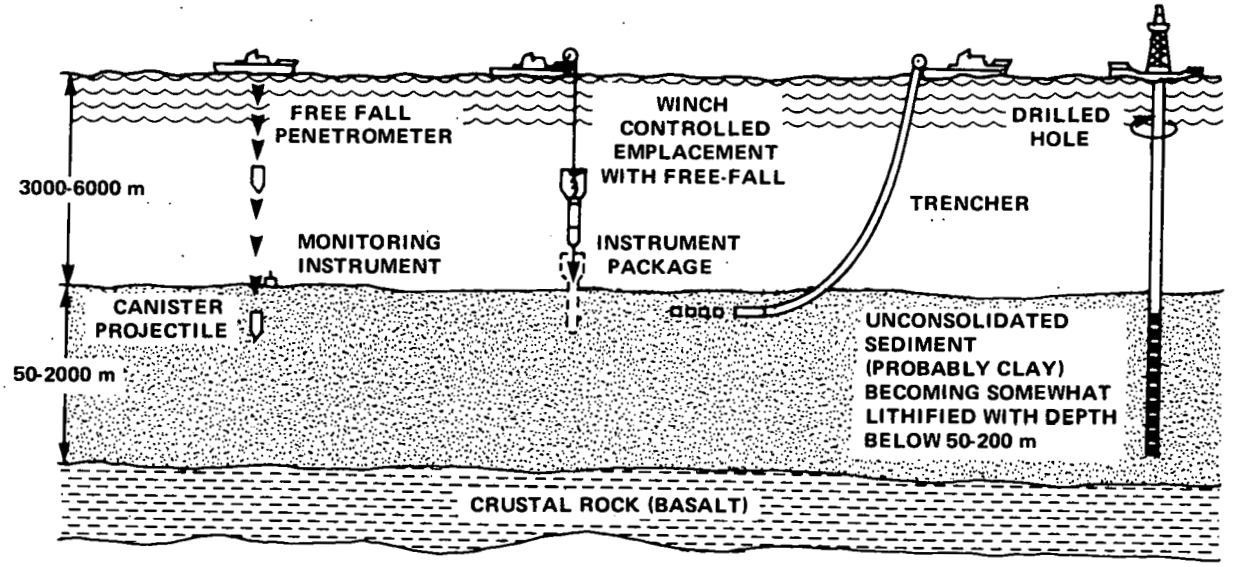
TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	100,151	91,800	138,119				

1.4 Seabed Disposal

The IRG concluded that nearer term alternative approaches to deep geologic disposal should be given funding support so that they may be adequately evaluated as potential competitors for waste isolation. The existence of deep sea technology such as deep seabed drilling, drill hole reentry, and deep sea emplacement and recovery of large equipment, makes it reasonable to include deep ocean sediments as a candidate medium for the disposal of radioactive waste. Such thick, uniform, and stable deposits of ocean sediment have accumulated over millions of years and are in the process of becoming sedimentary rock. Disposal in such sediments could provide effective isolation of radioactive waste from the biosphere.

The primary objective of the Seabed Disposal Program is to assess the technical, environmental, engineering, and institutional feasibilty of disposing of processed high-level nuclear waste and/or repackaged spent reactor fuel in geologic formations under the world's oceans. A secondary objective is to assess the seabed disposal options of other nations.

The program has adopted a reference system for study purposes even though that system may have to be altered as additional information is acquired. The reference seabed disposal system is the emplacement of appropriately treated waste or spent reactor fuel in a specially designed container into the clayey sediments in the middle of a suboceanic tectonic plate, under the hub of a surface circular water mass. The figure below illustrates several methods of emplacement.



Sediment Emplacement Concepts for Seabed Isolation

The Seabed Disposal Program was initiated in 1973 and is divided into four phases.

Phase 1. Determination of technical and environmental feasibility on the basis of historical data.
Completion date: 1976

Phase 2. Determination of technical and environmental feasibility from newly acquired oceanographic and effects data.
Completion dates: 1985-1987

Phase 3. Assessment of engineering feasibility.
Completion dates: 1990-1993

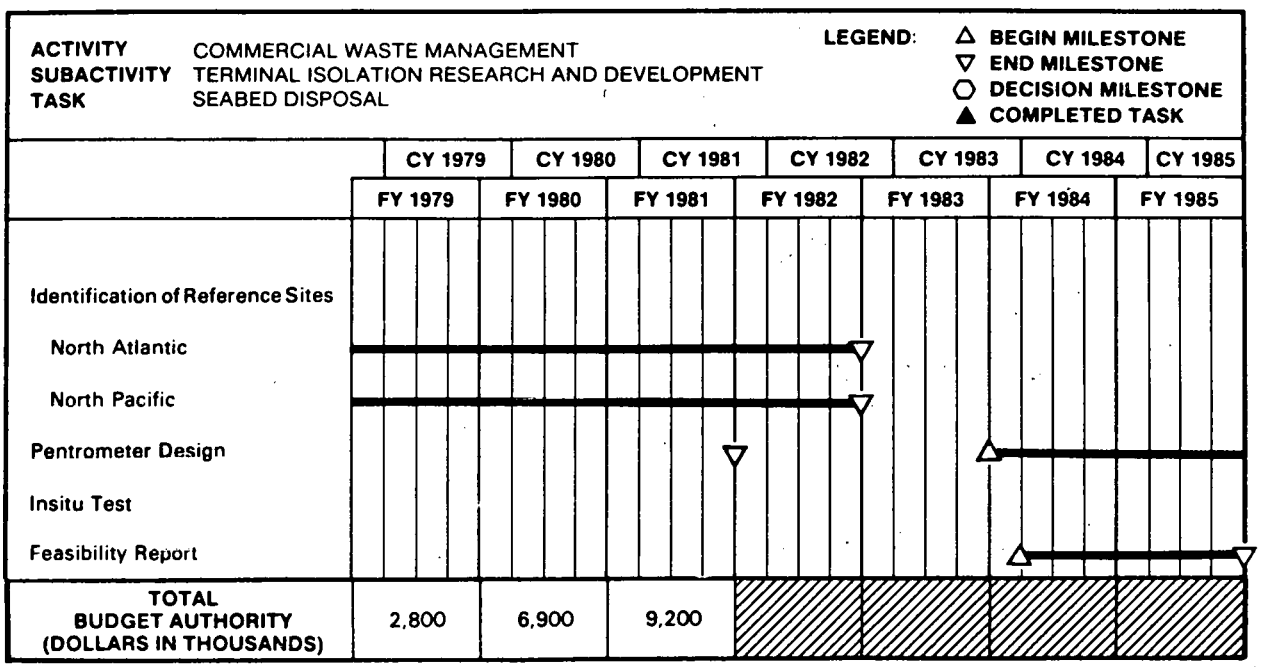
Phase 4. Demonstration of concept by semiroutine emplacement of waste canisters.
Completion date: Beyond 1995

Sandia Laboratories has the prime responsibility for coordinating and managing the program and has developed the following structured activity areas for the execution of Phase 2 of the program.

- Site Assessment and Surveying
  - Area Criteria Development and Identification
  - Site Criteria Development, Ranking, Assessment, and Monitoring
- Multibarrier Identification, Qualification, and Biological Transport
  - Near-Field Responses
  - Far-Field, Physical Oceanographic and Biological Transport
  - Radiation Sensitivity
  - Radionuclides Pathways to Man
  - Instrumentation Development
- Waste Emplacement
  - Model Development
  - Field Verification
- Transportation
  - Land and Sea Transportation
  - Port Facilities
  - Interim Storage

- Social Scientific Issues
  - National and International Political Issues
  - International Seabed Programs
  - Legal and Institutional Responsibilities
  - Public Response
- Risk/Safety Analyses
  - Risk Analysis
  - Safety Analysis
  - Security and Safeguards
- Economic Analysis
- Program Management
  - Quality Assurance
  - Project Management

An integral part of the Seabed Disposal Program is the Seabed Working Group of the Nuclear Energy Agency Radioactive Waste Management Committee, with representatives from the United Kingdom, France, Japan, Canada, The Netherlands, and the United States. This working group meets annually. The objectives of the group are to provide a forum for discussion of technical progress, plan future experiments, coordinate joint cruises and experiments, share facilities and unique test equipment, exchange technical information, and maintain cognizance of international policy issues relating to seabed disposal.



2.0 WASTE SYSTEMS EVALUATION AND PUBLIC INTERACTION

The primary activity within this budget category is the support of DOE's Waste Management Program. The two major efforts are:

- Federal/State Interactions
- Supporting Studies

The work includes the comprehensive planning for the Waste Management Program, interdepartmental program integration, preparation of Generic Environmental Impact Statements (GEIS's), and international studies.

Some specific supporting studies activities are:

International Program Support

The development and demonstration of radioactive waste technology and the evaluation of alternative fuel cycles and their corresponding waste management systems have become matters of great national and international concern, and the United States is actively involved in increased international cooperation. It is important that U.S. Government officials and DOE contractor personnel have easy access to collated and organized current information concerning the national and international radioactive waste management picture. This activity provides a program to assemble and maintain compilations of waste management data and foreign and international waste management program summaries.

Waste Management Safety Studies

Various existing and potential future fuel cycles do and will generate wastes in differing quantities, compositions, and physical and chemical forms. Integrated waste treatment, handling, transportation, storage, and isolation systems are required for managing these wastes. The scope of this activity includes the development and application of advanced methods for the comparative analysis of alternative waste management systems and technologies; and the development of an adequate data base to make such comparative assessments useful in the selection of those systems. The scope is limited to those fuel cycles that have nonproliferation and fuel utilization potential but includes consideration of the technical, economic, public, and institutional aspects attendant to the fuel cycles of interest. It also encompasses all parts of the fuel cycle.

Waste Management System Studies

This activity assures that waste management and its inherent safety function are given proper emphasis during nuclear fuel cycle evaluation by developing the methodology necessary to

permit safety assessments and identifying portions of waste management systems that could benefit by safety design emphasis. The activity includes methods of development and application. Systems for the management of radioactive wastes from nuclear fuel cycles will be evaluated emphasizing public health and safety in terms of radiological consequences. Occupational health and safety, nonradiological impact, reliability, and cost will also be considered to thoroughly evaluate trade-offs involved. Assessments will be limited to waste management activities that precede the final disposal step. Fuel cycle activities that will be assessed include irradiation, spent fuel processing, predisposal waste management, and possibly fuel fabrication. Methods development work related to decisionmaking processes will include the evaluation of practices in nonnuclear areas as well as techniques to accommodate societal viewpoints.

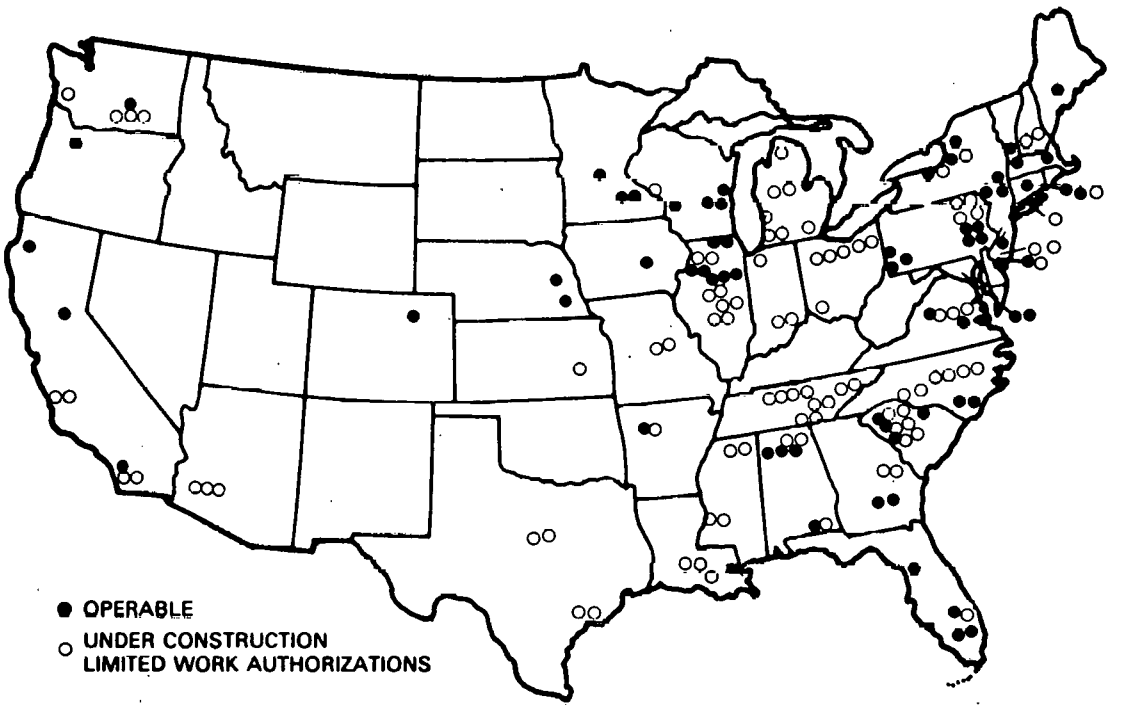
Quality Assurance

The Nuclear Quality Assurance Program Office (NQAPO), established in April 1978 at the Hanford Engineering Development Laboratory (HEDL), was created to provide the following support functions: (1) assist project and program managers in establishing appropriate quality assurance requirements and suitable methods and procedures for implementation, (2) assist in developing quality assurance policies, (3) develop quality assurance indoctrination and training courses for project and program personnel, (4) assist in the development of quality assurance standards and provide guidance in their application, and (5) coordinate and participate as needed in quality assurance audits of projects and programs. Activities of this office will provide quality assurance support to the WIPP Project Office and to the Basalt Waste Isolation Project (BWIP). In subsequent years, this support will be continued; and assistance will be provided, upon request, to other NEW projects and programs.

The remaining supporting studies are discussed in the following sections.

2.1 Federal/State Interactions

The deployment of a system to isolate nuclear waste within geologic formations will directly or indirectly affect all States within the contiguous United States. A particular State may be a beneficiary, generator, recipient, or any combination of the three. In the case of electricity generated by nuclear power plants, all States become beneficiaries by utilizing power grid interconnections throughout the United States and bordering countries, thereby increasing the reliability of electricity as a power source. The following figure shows the location of nuclear power plants and one type of nuclear waste generator within the United States.

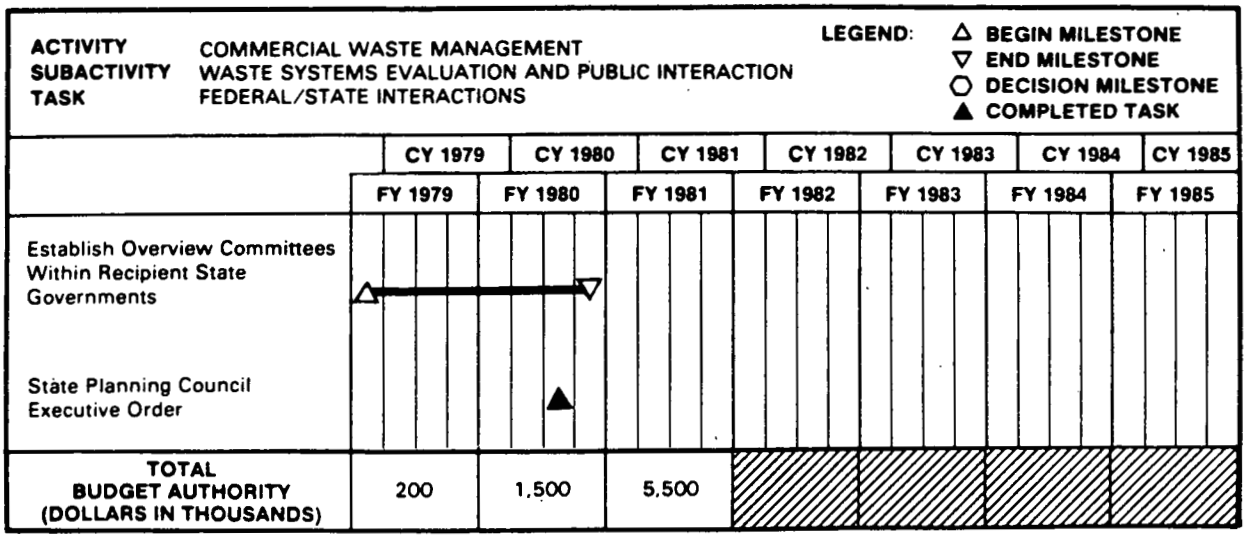


Central Station Nuclear Power Plants

The Federal/State interactions activity is directed to enhance the understanding of DOE's Waste Management Program and to provide for participation in the program by State and local governments. Direct support through grants will be given to potential recipient States. For example, because of the identification of a proposed repository at a specific site, the WIPP project in New Mexico, the developing relationship between DOE and the State of New Mexico is the leading example of State participation. The State enacted the "Radioactive Waste Consultation Act" in early 1979 which sets up a cabinet level task force to negotiate a mutually acceptable arrangement for State consultation. The Act also provides for a special legislative committee to oversee the activity.

Federal, State, and local officials have participated in two workshops regarding the development of a mechanism for involving State and local governments in the decisionmaking process for selecting a nuclear waste repository site. The workshops were conducted in April 1979 at Denver, Colorado, and in September 1979 at Eastbound, Washington.

A State Planning Council has been created by Executive Order No. 12192, dated February 12, 1980, to ensure that the needs of the States and localities be adequately addressed. The Council advises the Executive Branch and works with the Congress in making and implementing decisions on waste management and disposal, such as planning and siting, construction, and operation of facilities.



2.2 Supporting Studies

Information and data, evaluations of health and safety, economics, risk assessments, quality assurance, and EIS's are developed and reviewed to support the waste management program. Evaluations are prepared on alternative systems for treatment and disposal of radioactive waste from the conventional light water reactor (LWR) fuel cycle and from other fuel cycles such as identified in International Nuclear Fuel Cycle Evaluation (INFCE) and Nuclear Alternative System Assessment Program (NASAP) studies as having nonproliferation potential. A program has been established to keep abreast of all international programs dealing with waste management.

Battelle Pacific Northwest Laboratory (BPNL) is the lead site for technology base assessments preparation of the GEIS on Management of Commercially Generated Radioactive Waste, coordination of certain aspects of international programs, performance of safety studies, and evaluations of alternate waste management technology including technology for changing the nature or reducing the amount of waste generated.

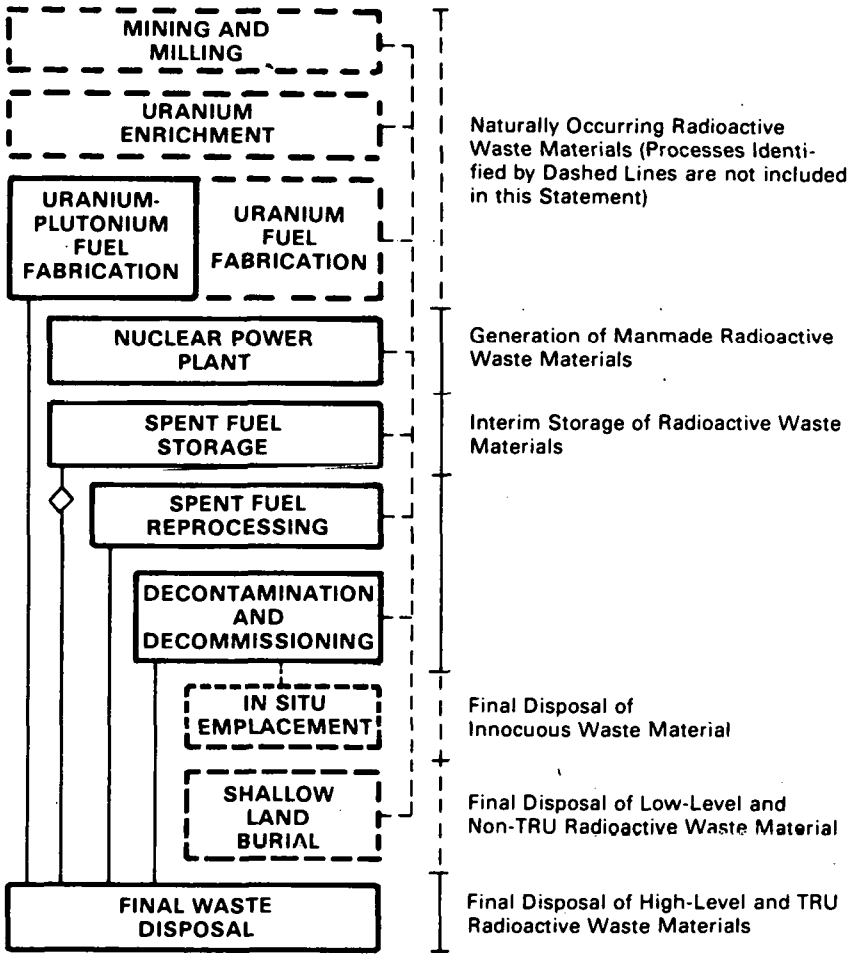
The Committee on Radioactive Waste Management (CRWM) of the National Research Council (NRC), (NAS/NAE/IOM), is being supported to independently evaluate and report on all major waste management programs as well as activities at all plant operating sites.

The nuclear fuel waste management cycle is illustrated in the figure on the following page.

Status

A comprehensive GEIS is being prepared to support the Commercial Waste Management Activity. This statement will evaluate the environmental impacts of the various technologies in the activity.

The scope of the GEIS focuses on the post fission radioactive wastes which are identified for Federal custody in present or proposed NRC regulations (high-level and TRU wastes). The activities include storage, treatment, transportation, and final disposition, regardless of whether they are carried out by industry or by DOE. The sites of the activities described will be typical or hypothetical. The GEIS does not eliminate the need



Nuclear Fuel Cycle Waste Management

for future environmental statements, either by NRC or DOE, to cover a specific waste repository or the installation of a specific waste treatment process at a specific commercial plant. Three possible fuel cycles are evaluated.

The Draft GEIS was published and distributed for review and comment in April 1979. Copies were distributed to Federal, State, and local agencies, organizations, individuals known to be interested in radioactive waste isolation, those requesting copies based on notices of availability in the Federal Register, and other media. Public hearings were held in:

Washington, D.C.
Chicago, Illinois
Atlanta, Georgia
Dallas, Texas
San Francisco, California

Individual comments and those resulting from the hearing process will be reviewed and incorporated into the final GEIS, which is scheduled for completion in mid-1980.

The INFCE support work on nuclear waste management (Working Group 7) has been completed. A report was submitted to be reviewed by the Technical Coordinating Committee in November 1979. They will present a compendium of five reports to the Plenary Committee for review and final publication in February 1980.

A Comprehensive Nuclear Waste Management Plan (CMP) will be prepared starting in FY 1980. The purpose of the CMP is to present a comprehensive statement of the Federal strategy and timetable for resolving nuclear waste management issues. It will address the technical problems, institutional issues, role of Federal agencies, provisions for participation by State and local government, funding requirements and the source of funds, and the Federal legislation necessary to implement the plan. All sources of nuclear waste will be considered including mining and milling operations; the commercial nuclear power fuel cycle; R&D, medical, and other peaceful uses of radioactive materials; and National defense activities. The progress for preparing the plan will include opportunity for public comment prior to final drafting and publication. The plan is scheduled for publication in 1981 and will be updated biennially thereafter.

Other specific activities scheduled for FY 1981 include:

- Quality assurance assistance to Nuclear Waste Management Programs in the form of personnel training, recommendations of appropriate methods and procedures, preparation of documentation, implementation of standards, and the conduct of audits

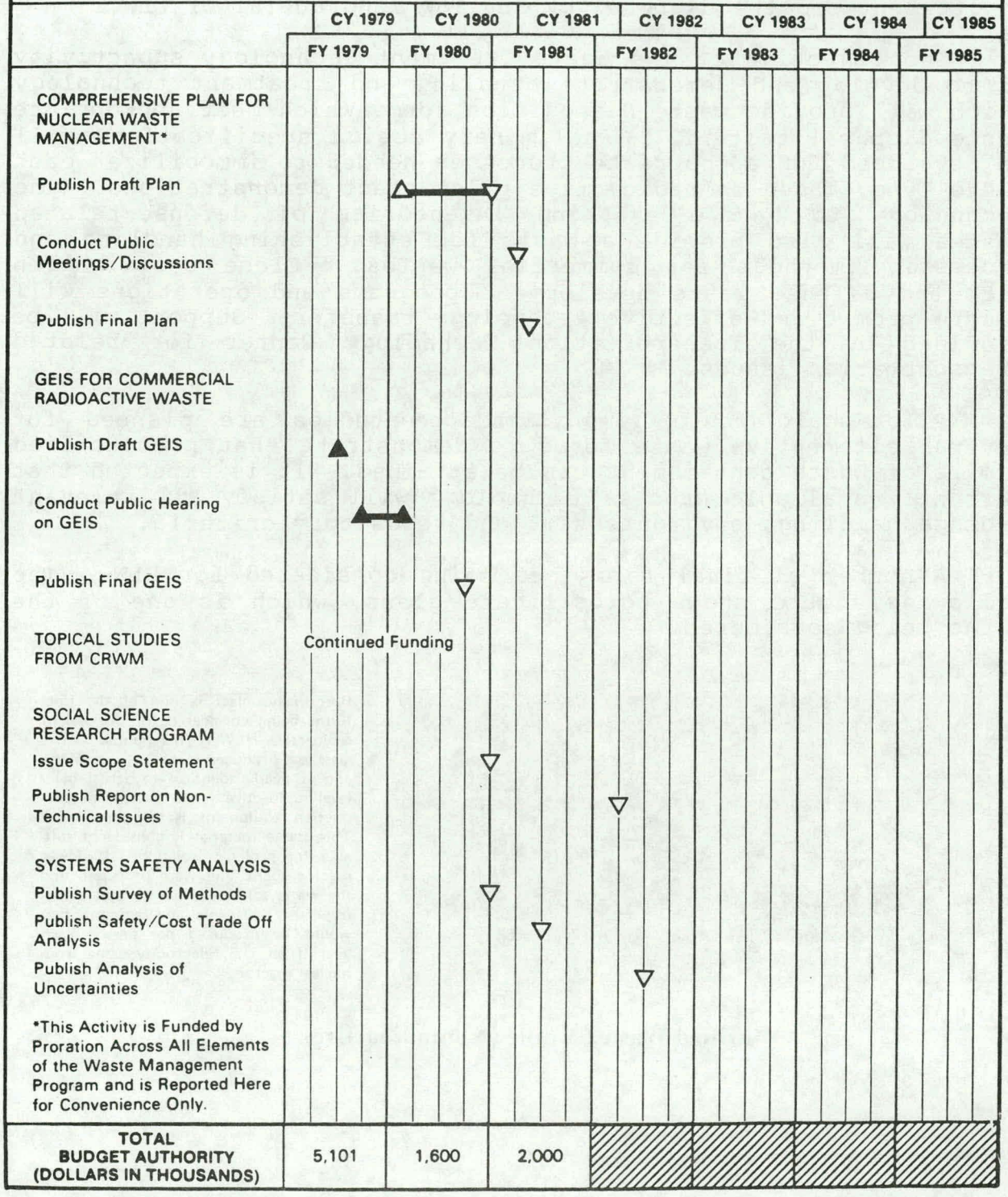
- Waste Management Systems Studies to provide cost estimates, technical assessments, and analysis of public attitudes and issues for use in the comparison of alternatives

- Continued development of an improved methodology for Nuclear Waste Management safety assessments

- Continued review of Waste Management Programs by the NAS

ACTIVITY COMMERCIAL WASTE MANAGEMENT
SUBACTIVITY WASTE SYSTEMS EVALUATION AND PUBLIC INTERACTION
TASK SUPPORTING STUDIES

LEGEND:
△ BEGIN MILESTONE
▽ END MILESTONE
⬡ DECISION MILESTONE
▲ COMPLETED TASK



TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	5,101	1,600	2,000				

3.0 WASTE TREATMENT TECHNOLOGY

This part of the Commercial Waste Management Activity deals with R&D associated with the treatment of radioactive wastes prior to their shipment to a Federal repository for terminal emplacement and the disposal by shallow land burial of LLW.

The objective of the Waste Treatment Technology subactivity is to develop and demonstrate handling and treatment technology which will provide waste disposition forms which meet appropriate waste disposal criteria. Preliminary design specifications will be developed for appropriate processes needed to immobilize each waste type, based on radioactive pilot plant demonstrations. The technology to handle existing inventories of defense-related wastes will also provide a basis for establishing handling and processing methods for commercial wastes. Close coordination with the defense waste development programs and operations will ensure prompt and effective technology transfer. Support will be provided by the Transportation Technology Center for related transportation issues.

Pilot-scale waste immobilization studies are planned for several alternative waste forms to demonstrate that prespecified limits of waste containment can be attained. It is expected that currently available process technology will satisfy all relevant storage handling, environmental, and repository criteria.

A number of final forms are being considered for HLW. The following figure shows borosilicate glass, which is one of the forms being considered.

Borosilicate glass is one of the final forms being considered for disposal of radioactive HLW. This nonradioactive glass was produced in a plant-size melter and is nearly identical to actual high-level radioactive waste glass. The production equipment is well developed. This stable material is considered suitable for geologic isolation. If power reactor spent fuel were processed and the waste solidified, one of these pieces of glass represents the amount that would be produced per person each year if all U.S. electricity came from nuclear reactors.

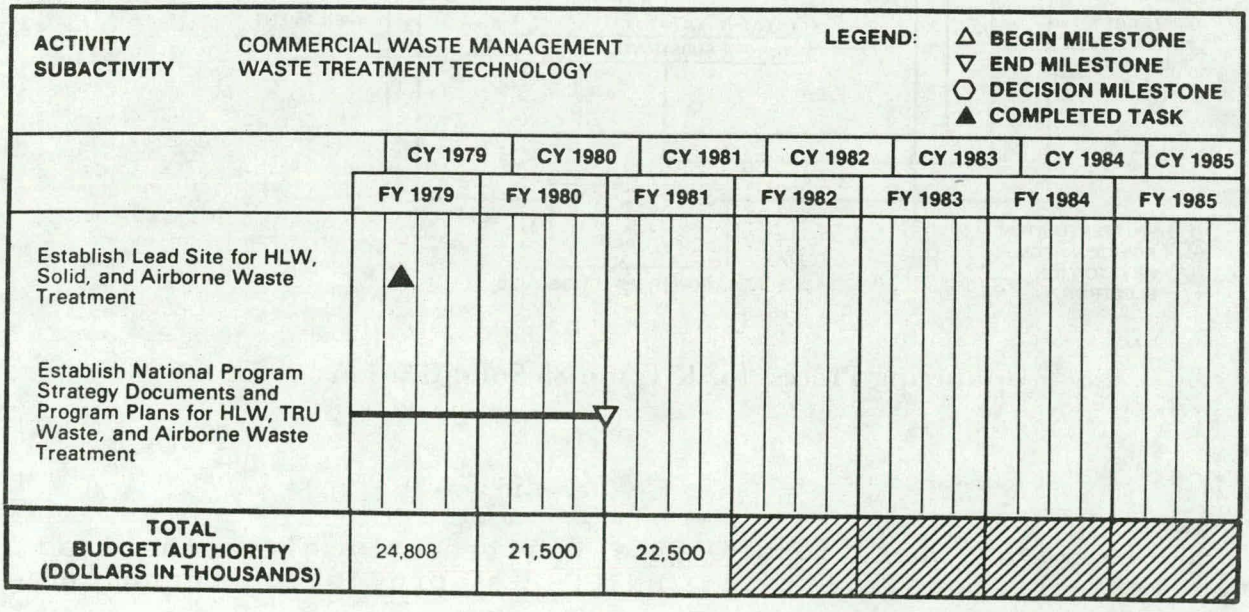
Vitrified Waste Sample (Nonradioactive)

Status

The HLW R&D program is designed to identify an immobilization process and a waste form for treating existing commercial wastes. It also supports the treatment of wastes which may arise from alternate fuel cycles in the late 1980's. Portions of the gaseous and contaminated solid waste activities will provide a technology base to help meet the new, more stringent Environmental Protection Agency (EPA) emission standards.

National program strategy documents will be established for each waste type and will be periodically updated. As soon as major treatment methods have been developed and demonstrated, technology transfer documentation, including appropriate design information, will be prepared, and then the methods and documentation will be made available to the commercial industry. If it is decided to proceed with an alternative fuel cycle, including chemical processing of reactor fuel, appropriate programs will be established to support the first full-scale plants for converting waste to products which meet Federal repository acceptance criteria, NRC regulatory requirements, and all other applicable standards and regulations.

Techniques will be developed to handle existing and future wastes from fast flux reactors. Radioactive sodium coolant and sodium-contaminated components of fast flux reactors present unique waste handling problems. Treatment methods will be developed to convert these wastes into forms which can be routinely handled and stored.

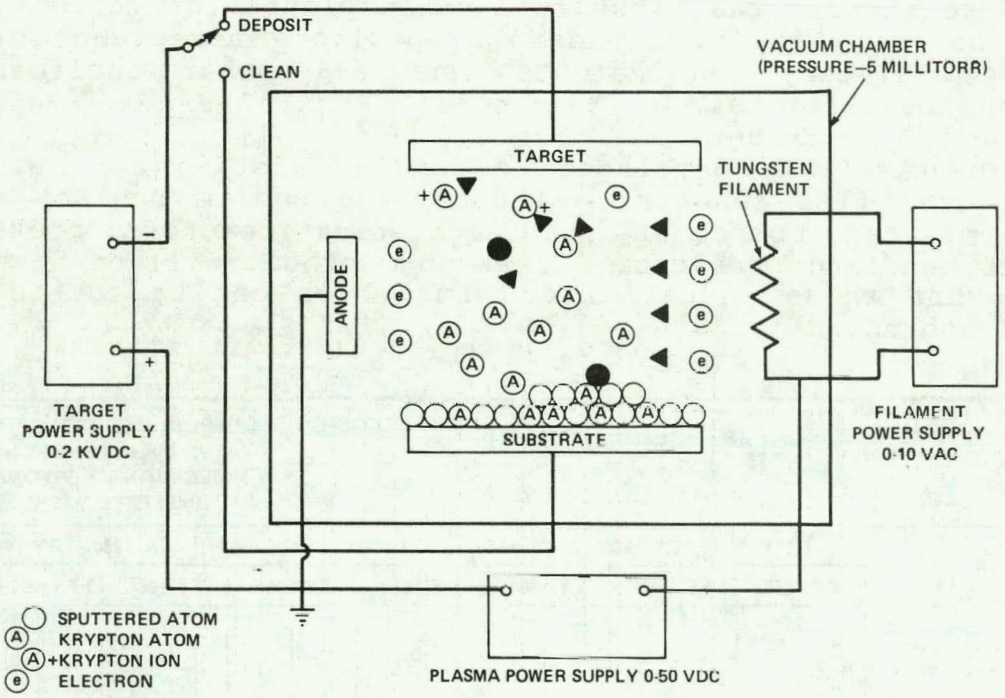


3.1 Airborne Waste

The Airborne Waste task was developed to provide technology needed to capture and manage the radioactive materials found in the off-gas from nuclear facilities in a manner which protects the public health and safety, produces minimal environmental impact, and meets all applicable laws and regulations.

These wastes arise from nuclear reactors, irradiated fuel storage, reprocessing of spent fuels, and waste treatment processes such as waste incineration and vitrification.

This task includes development of technology for waste treatment criteria; krypton-85, carbon-14, and iodine-129 immobilization and storage; and gaseous waste monitoring. One method under investigation for krypton-85 immobilization in metal using a sputtering process is shown in the figure below.



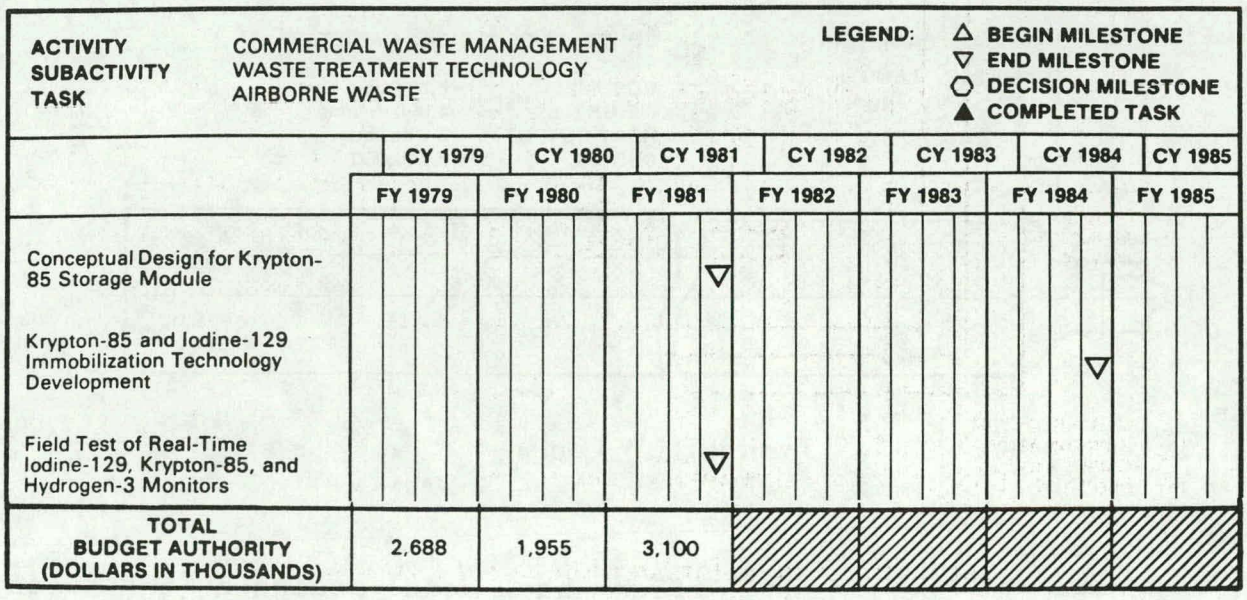
Sputtering Process for Krypton-85 Solidification

Status

DOE's Idaho Operations Office was recently given the lead management responsibility. ENICO is providing technical assistance.

The DOE R&D work in this area encompasses all aspects needed to monitor, concentrate, collect, immobilize, package, transport, store, and prepare for disposal of these waste materials from commercial facilities. Specific activities currently being pursued are structured to accomplish the following objectives:

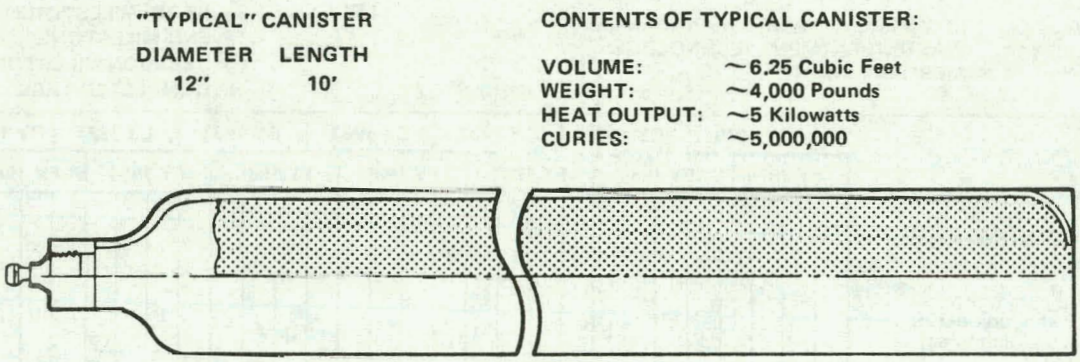
- To provide a national strategy plan for managing all airborne wastes by 1980
- By 1980, to develop storable waste forms for krypton-85, iodine-129, and carbon-14, and demonstrate suitable processes for producing these forms by 1984
- By 1982, to develop the capability to monitor in real-time airborne waste streams containing carbon-14, iodine-129, and krypton-85
- By 1981, to develop the conceptual design for a storage facility for krypton-85
- To provide technology to treat and manage airborne wastes which will be generated in alternative fuel cycles now under investigation



3.2 High-Level Waste

As nuclear fuel is used in a reactor, the uranium fuel material is slowly converted by the nuclear reaction into solid fission products dispersed uniformly through the fuel material in the fuel rods or as gases entrapped within the fuel rod. If the fuel elements are processed by chemical extraction to recover the useful materials in the spent nuclear fuel rod, high-level nuclear wastes containing radioactive fission products remain. The wastes are initially in a liquid form and must be converted into a dry, stable solid for final disposal to ensure that required safety, environmental, and public health standards are met and maintained.

This task is directed toward the development of immobilization technology for existing high-level radioactive wastes. Waste forms which increase the stability and minimize the possibility of dispersion are being developed. Borosilicate-type glasses, synthetic minerals, ceramics, concrete, clay, and metal matrix forms are being evaluated. This activity is closely coordinated with defense waste immobilization activities and transportation systems being developed by the Transportation Technology Center. A typical HLW canister is depicted below.



Typical HLW Canister

Status

DOE's SR Operations Office has been assigned the lead management role. E. I. Du Pont de Nemours and Company at SR Laboratory is providing technical assistance.

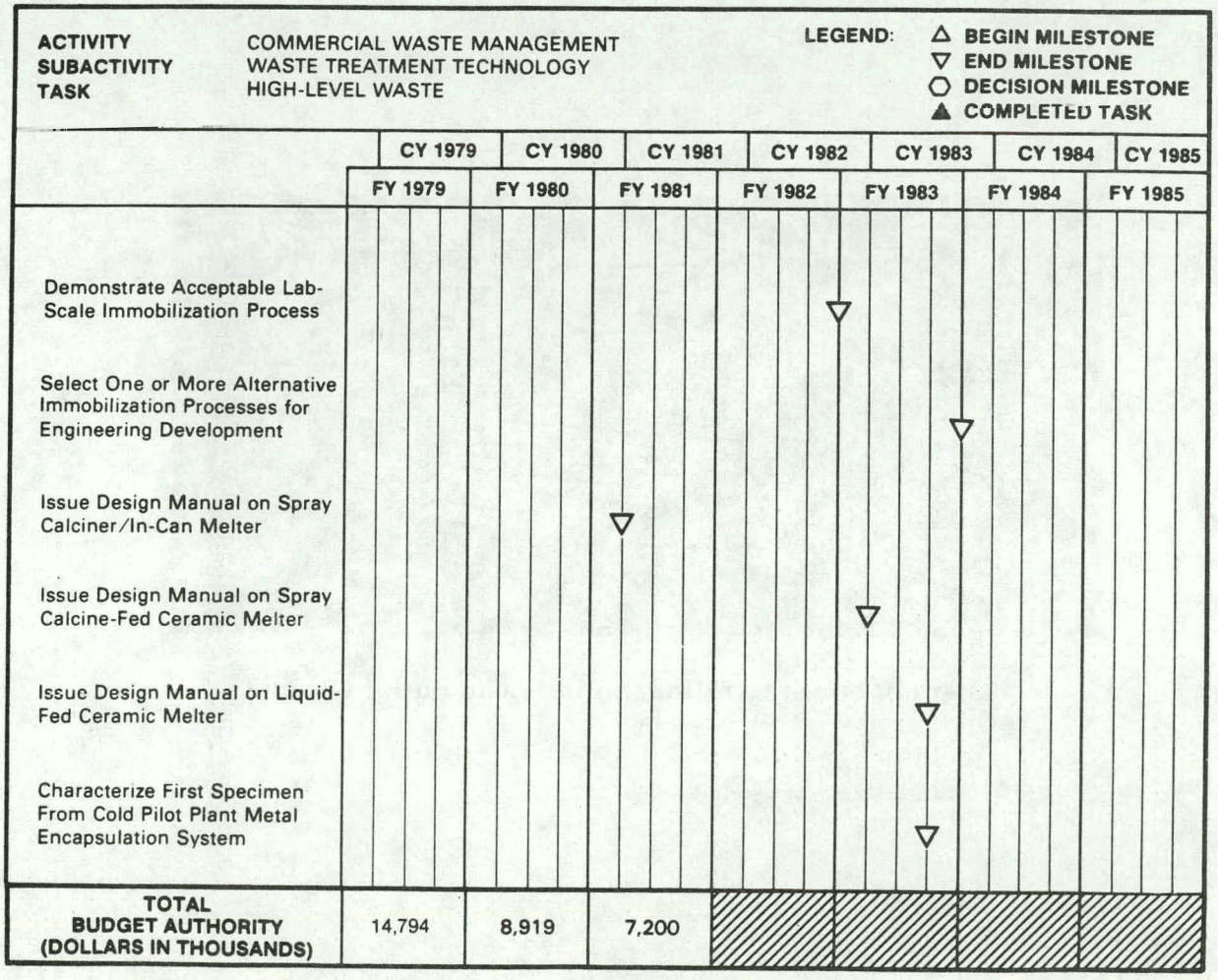
The R&D program for HLW includes the development of technology for a spray calciner/in-can melter process, fluid-bed calciner/continuous melter process, direct liquid-fed continuous melter process, fluid-bed calciner process, alternative waste form processes, and waste form quality verification. The program will confirm solidification and packaging technology by preparing full-scale canisters of immobilized waste. Pilot plant facilities will be used to immobilize and encapsulate the waste

products. Processes being demonstrated are calcination, batch melting, continuous melting, in-can melting, liquid-fed melting, and various combinations.

Development of waste forms and associated processes are being expedited as alternatives to glass; these include synthetic minerals, special concrete, ceramics, cermets, and metal matrix materials.

Work to date has concentrated on nonradioactive laboratory and engineering scale demonstrations of various processes which can safely treat and contain the waste. Waste materials needs and evaluation will be coordinated for the total waste management program by the Waste Materials Steering Committee.

Two canisters of commercial radioactive waste glass from the nuclear waste vitrification demonstration are being evaluated for destructive tests and for experimental placement in a geologic repository test. The current activities include the modification of existing facilities, construction of additional facilities needed, and installation of equipment. Plans are being prepared for nonradioactive and radioactive waste test, evaluation, and operations.



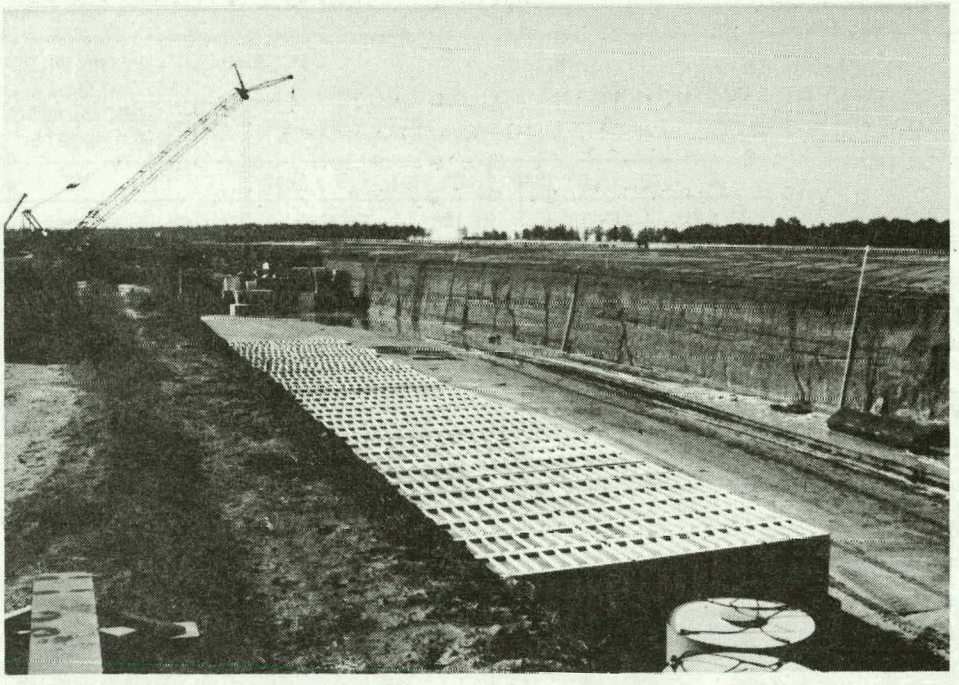
3.3 Low-Level Waste

Commercial LLW is a byproduct of nuclear power reactor operation, medical and industrial use, and R&D activities. Typical examples of solid LLW are discarded equipment and metals, filters from the cleanup of gaseous wastes, ion-exchange resins from the cleanup of liquid wastes, liquid wastes that have been converted to solid form by techniques such as mixing with cement to make concrete, and miscellaneous trash such as paper, rags, glassware, and protective clothing. (Some liquid LLW is decontaminated and released under controlled conditions.)

The objective of this task is to develop technology which can be made available for commercial LLW management.

Techniques developed under the defense LLW program may be equally applicable to commercial LLW. Transfer of that technology will complement the commercial LLW program.

The figure below shows emplacement operations at a typical LLW burial ground.



Barnwell, South Carolina, Solid Waste Burial Ground

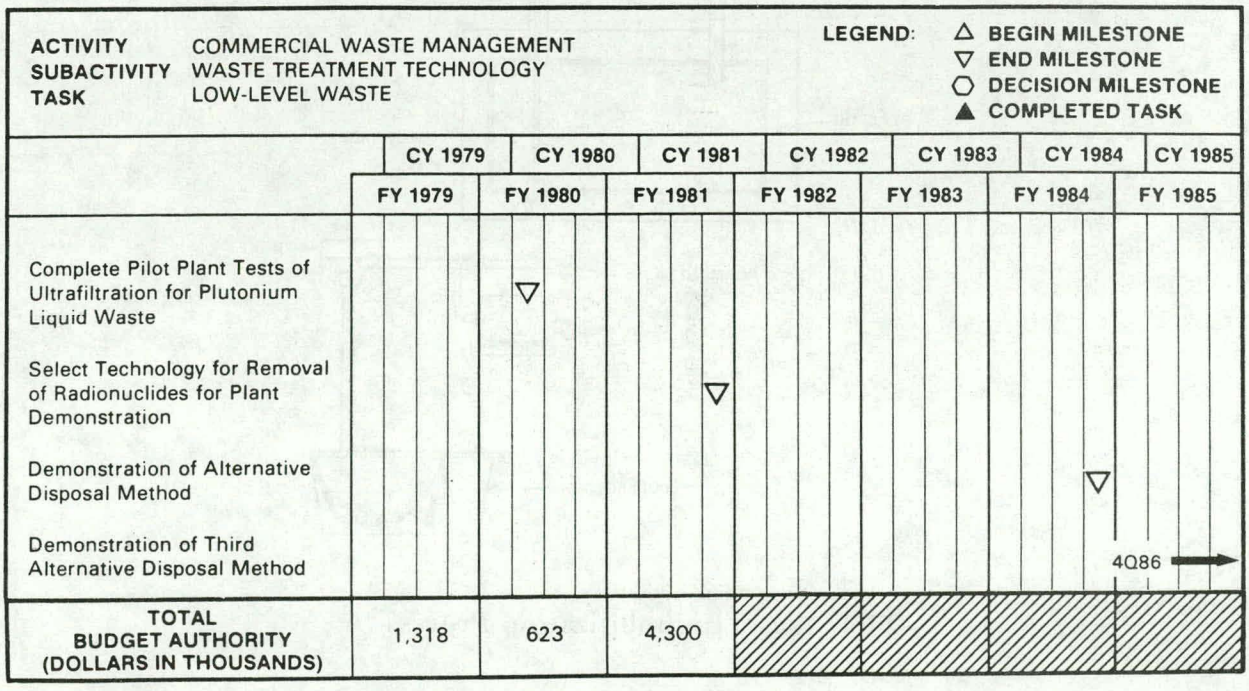
Status

The lead management role for this task was assigned to DOE's Idaho Operations Office, with associate lead to DOE's Oak Ridge Operations Office. Those groups chose Edgerton, Germeshausen and Grier Corporation (EG&G) at INEL and Union Carbide at ORNL to provide technical assistance for their management activities.

In concert with the Defense Waste Management Activity, the R&D program for LLW encompasses all aspects of the technology for treatment, handling, and disposal by shallow land burial or alternate disposal methods. The funding provided by the Commercial Waste Management Activity is principally directed to the development of technology for removal of radionuclides from liquid LLW, immobilization of waste concentrates, and alternative disposal methods. Three low-level liquid waste purification processes are currently being developed for removal of radioactive contaminants from effluent streams (as alternatives to evaporation). It is planned to demonstrate at least one process by 1985.

Current activities include investigation of ultrafiltration, selective absorbents, and biological concentration processes, as well as concreting, as methods for solidifying resulting sludges.

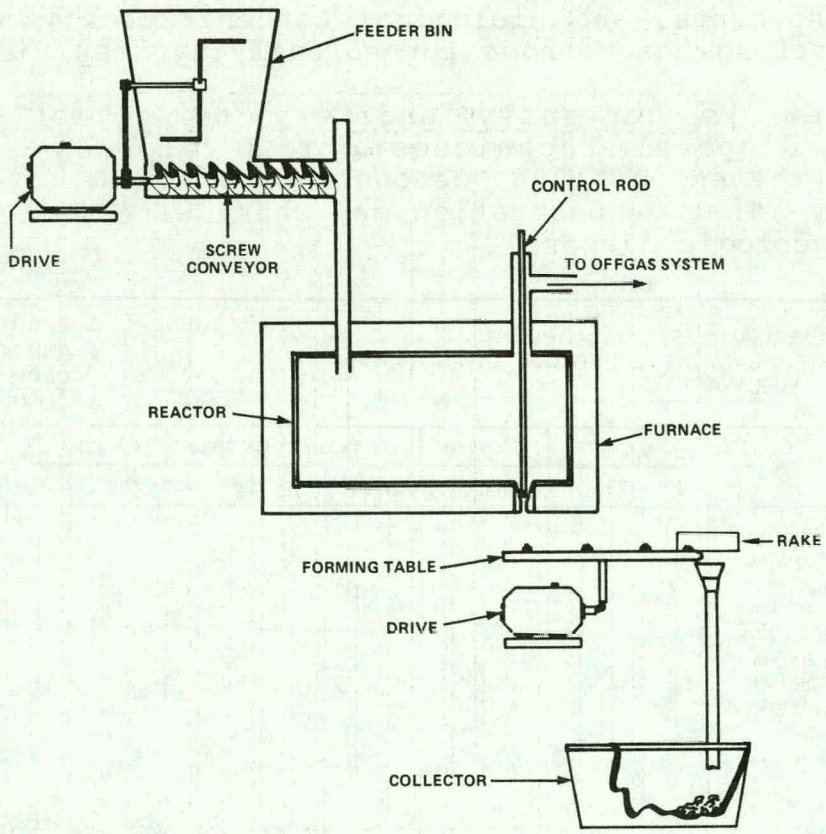
A review is currently underway to select promising alternative disposal techniques for development and field testing. By the end of 1984, demonstration of one of these will be completed. That demonstration may share with waste isolation in tests of geologic disposal.



3.4 Transuranic Waste

TRU-contaminated solid waste is contaminated with TRU nuclides above a threshold concentration of ten nanocuries per gram. This threshold was derived on the basis of certain natural uranium-containing ores and is currently under review by DOE and NRC. Waste below this threshold level is acceptable for shallow land burial at controlled sites as LLW. Plutonium-239 is the nuclide of principal concern in TRU waste because of its long half-life of 24,000 years. In terms of both volume and mass, the proportion of radioactive material to the contaminated material is minute.

This task involves development of technology leading to demonstration of a cyclone incinerator system at a nuclear power plant in FY 1984. In addition, this task includes development and demonstration of a TRU waste immobilization process. The process will convert incinerator ash and process sludges to a vitrified waste form. Development work is underway for the treatment of existing TRU waste from LMFBR activities containing unreacted sodium, including a protype facility.



TRU Waste Immobilization Process

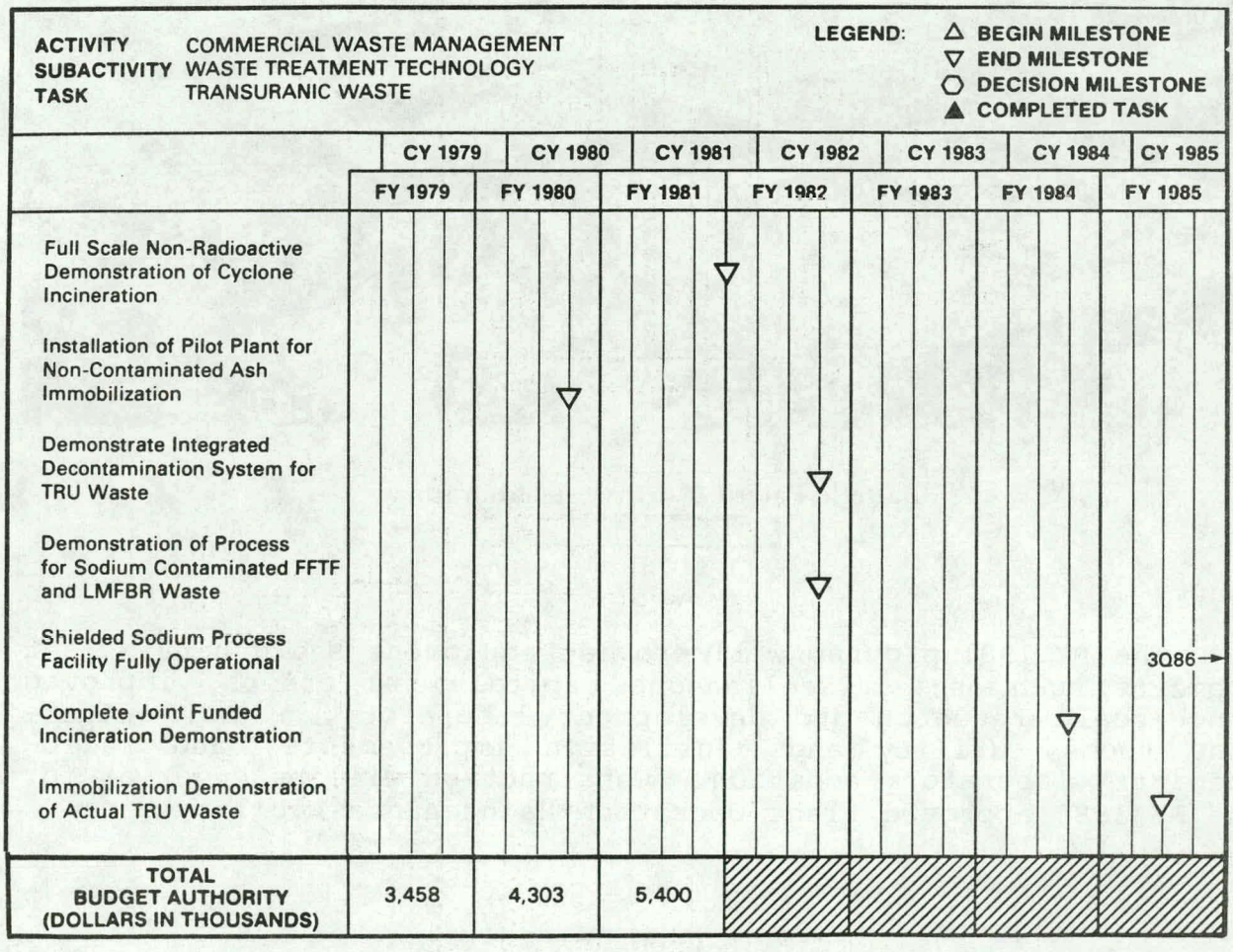
Status

The management of this program was assigned to DOE's AL. Rockwell International at Rocky Flats is providing technical assistance.

The R&D program for TRU-contaminated solid waste has the primary objective of developing and demonstrating solid waste treatment methods (incineration, immobilization, etc.) required to meet Federal repository acceptance criteria.

During FY 1978, testing of three prototype TRU-contaminated solid waste treatment systems (Controlled Air Incinerator, Fluidized Bed Incinerator, and Acid Digestion) was initiated, and radioactive tests begun if warranted.

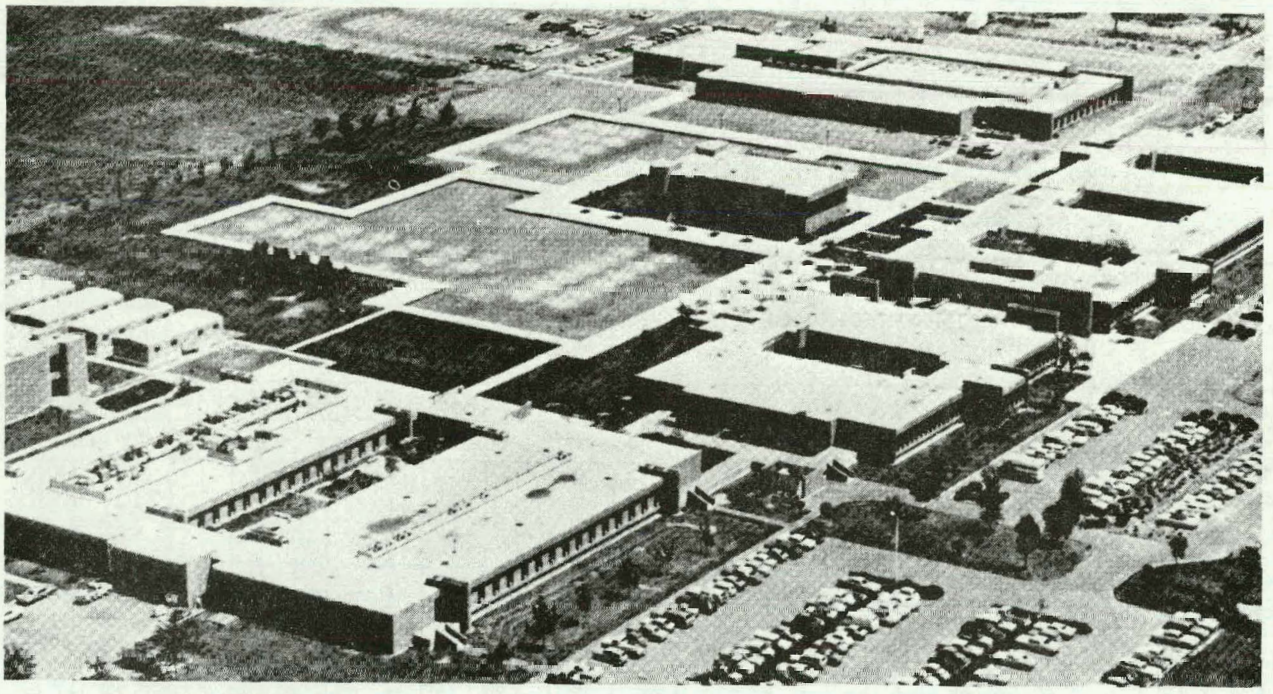
Work is continuing on the demonstration of the incineration of combustible TRU waste. Also, the use of electropolishing for decontaminating metal surfaces is being tested on a pilot scale.



3.5 Battelle Pacific Northwest Laboratory Landlord Responsibilities

Landlord functions at the various DOE installations provide the general purpose equipment and facilities required in support of the overall operation at the site.

The funding is provided by the Headquarters program which supports the major portion of the work being conducted at the installation. NEW has assigned the landlord funding responsibility to BPNL as part of the Commercial Waste Management Activity.



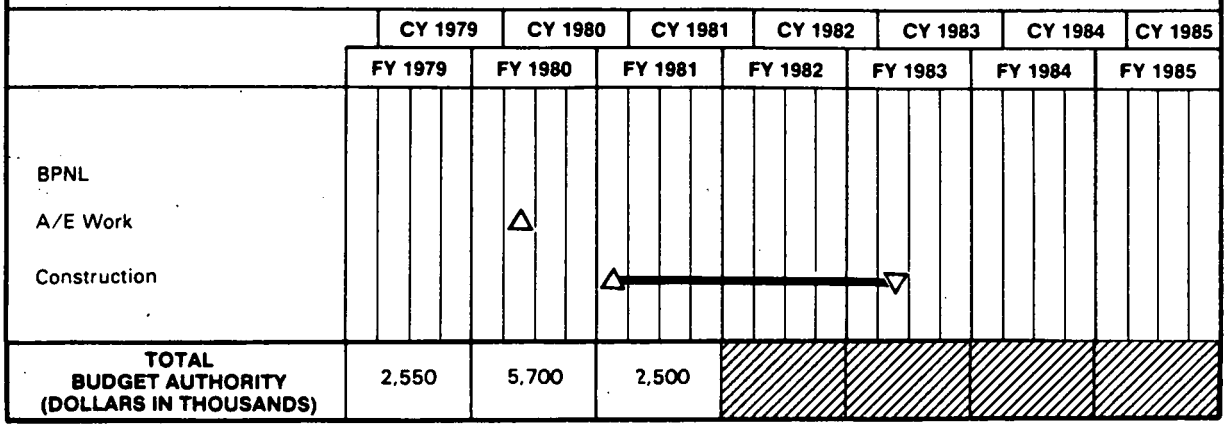
Battelle Pacific Northwest Laboratory

Status

The FY 1981 program will provide equipment and general plant projects such as: miscellaneous capital work orders, improved bench-scale research and development laboratory, animal quarantine rooms, utility and ventilation improvements, and radiochemistry laboratory addition. Construction will be underway for the FY 1980 approved Plant Operation Maintenance Facility.

ACTIVITY	COMMERCIAL WASTE MANAGEMENT
SUBACTIVITY	WASTE TREATMENT TECHNOLOGY
TASK	BATTELLE PACIFIC NORTHWEST LABORATORY LANDLORD RESPONSIBILITY

LEGEND:
- △ BEGIN MILESTONE
- ▽ END MILESTONE
- ⬡ DECISION MILESTONE
- ▲ COMPLETED TASK



TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	2,550	5,700	2,500				

C. COMMERCIAL NUCLEAR WASTE — REMEDIAL ACTION PROGRAM

DOE maintains a program for managing the D&D of all surplus nuclear facilities it owns. In addition, DOE is conducting a program for determining the need for remedial actions to eliminate potential radiological exposure to people and potential harm to the environment due to residual contamination at formerly utilized laboratories and manufacturing or processing sites and at certain inactive uranium mill tailing storage sites.

The DOE program of surplus facility management and remedial actions is divided into the following program subactivities:

- Formerly utilized Manhattan Engineer District/Atomic Energy Commission (MED/AEC) Sites - Conduct remedial action at sites having radiological contamination above current unrestricted guidelines. This includes about 30 locations.

- Grand Junction Remedial Action Program - Remove tailings from Grand Junction structures as required by public law. It is estimated that 800 structures will qualify for remedial action.

- Uranium Mill Tailings Remedial Action Program - Implement remedial actions at inactive uranium mill tailings sites as required by public law. This includes 25 designated sites.

- Surplus DOE Facilities - Conduct D&D of some 500 surplus radioactive-contaminated DOE facilities. This program includes decommissioning Shippingport Atomic Power Station.

The DOE goal is to perform the remedial actions in the first three categories above in the most expeditious manner at an estimated average annual cost of $50 to $70 million.

The surplus DOE facilities category includes 80 projects at over 20 locations. The goal is to complete these projects by the year 2000.

The ASNE has the primary responsibility for the Remedial Action Program. The Assistant Secretary for the Environment (ASEV) also has specific assignments within the program.

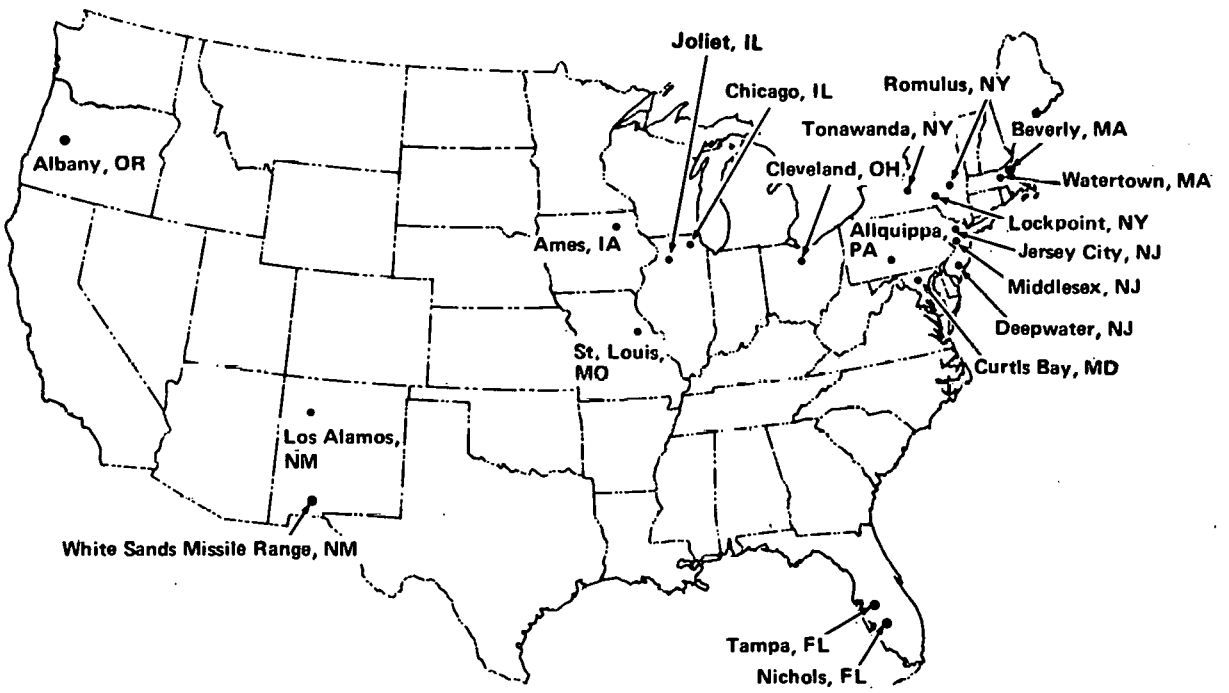
These ASEV responsibilities are the conducting of radiological surveys, determination of need for and extent of cleanup required, operational safety and environmental overview including independent audits, participation in determination of priorities in remedial action projects, review of NEPA documents prepared by the Office of Nuclear Energy (NE), and certification of compliance with criteria after completion of projects.

The ASNE has the responsibility for technology development and testing, operations projects, preparation of NEPA documents, participation in determination of priorities, implementation of remedial actions, and other activities necessary to carry out the Department's programs and the recommendations of the IRG when finalized.

A major problem resulting from this cleanup program is what to do with the large volume of very low-level contaminated waste collected. DOE expects 20 to 30 million cubic feet of waste to result from the Remedial Action Program at former MED/AEC sites and D&D of DOE facilities. The total low-level waste disposal at the 6 commercial and the 7 DOE burial sites through 1976 was 51 million cubic feet. This new large volume will require large additional burial ground capacity. The alternatives for solving this problem are being studied on a nuclear waste management systemwide basis.

1.0 MANHATTAN ENGINEER DISTRICT/ATOMIC ENERGY COMMISSION SITES

Commercial firms were involved in the processing of ores for the extraction of uranium in the early nuclear program. The residual contamination was later decontaminated in accordance with the standards and survey methods then in existence. However, radiological criteria and proposed guidelines for release of sites for unrestricted use has become more stringent. In 1974, a program was initiated to identify these formerly used MED/AEC sites and to reevaluate their status. A total of 126 MED/AEC sites have been identified to date. The radiological status of 50 of these was clearly determined from the records. Thirty of the remaining 76 require decontamination efforts; the other 46 have been inspected and verified for continued unrestricted use. The search for other sites is continuing. The map of MED/AEC sites requiring remedial action shows the extent of the ongoing problem. The number of map locations shown is less than 30 because in some cases more than one remedial action site is located at a particular map location.



Sites Requiring Remedial Action

Status

Three paramount issues must be addressed and solutions defined before the completion of the sequence of events leading to remedial actions:

- Radiological criteria must be developed for use as guidelines to determine the extent of decontamination required at each site.

- Disposition sites for material removed from a formerly utilized site during the remedial action must be defined. Without a plan for permanent disposition of the material, efforts toward the remedial action program would be incomplete.

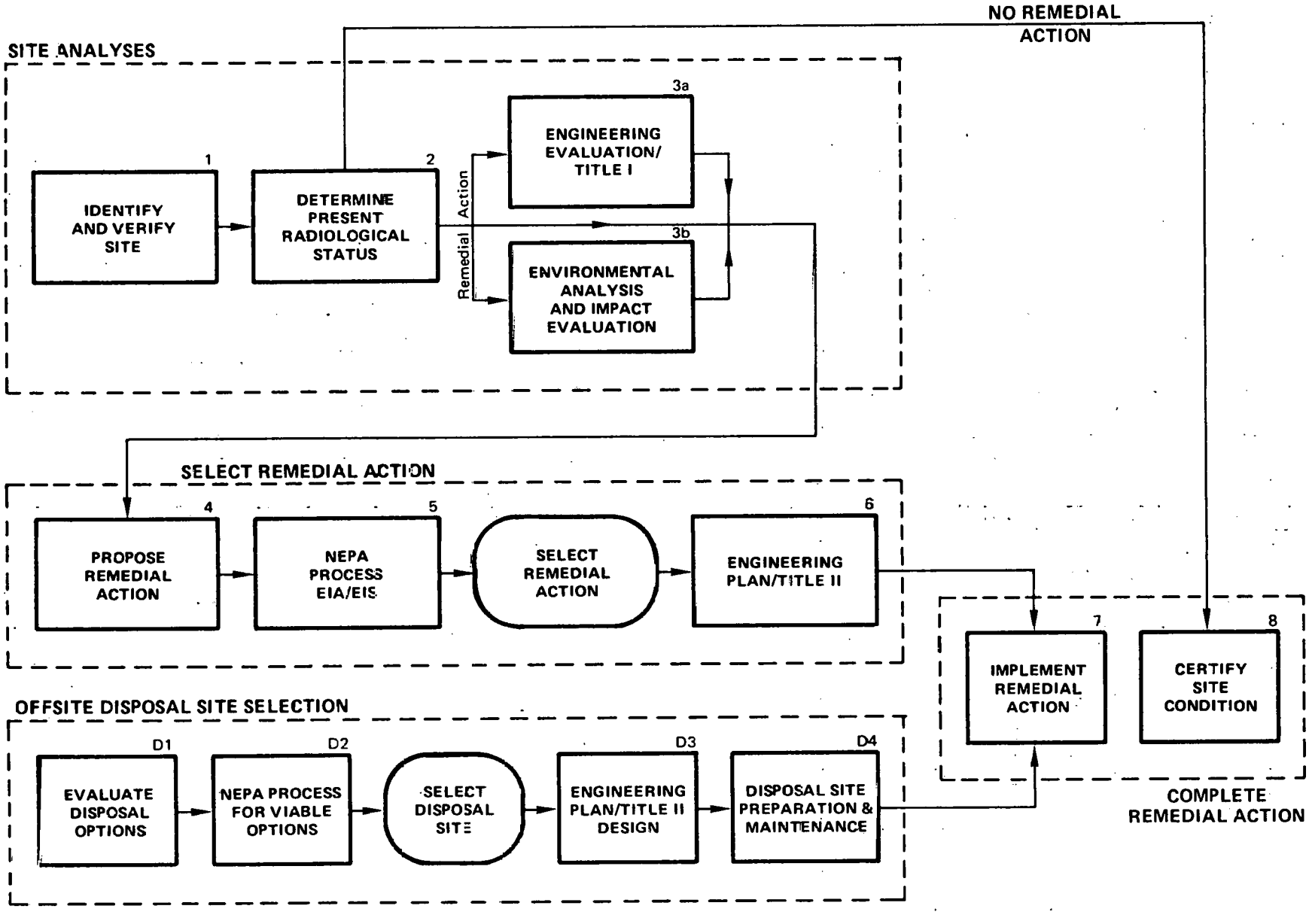
- Legislative authority must be established by which the Federal Government (DOE) can act to correct problems of radiological contamination at certain formerly utilized sites. Sites of particular concern are those never owned by the Federal Government but used under Government contracts where the contract document does not indicate the responsibility for cleanup.

Resolution of these issues may be the limiting factor for the completion of remedial actions in some cases.

The following figure, the Sequence of Events Leading to Remedial Action, shows the interrelationship of the actions which must be taken to get to the ultimate program objective of certifying a site for unrestricted use.

Under DOE's decentralized organization, the Oak Ridge Operations Office has been assigned the responsibility to select a Program Management Contractor (PMC) during FY 1980. The PMC will conduct or procure engineering and environmental analyses required to support the planning and NEPA documentation of the remedial actions and oversee remedial and other contractor operations.

The remedial action at the Kellex Site in Jersey City, New Jersey, will be completed in early FY 1980 and the site certified for unrestricted use. The highest priority is to begin the decontamination and restoration of private property in Middlesex, New Jersey, in close coordination with the State and borough authorities. Planning assistance to the St. Louis Airport Authority and St. Louis Police Academy will begin during FY 1980. An organized plan of work including establishment of priorities will be established for the remaining sites requiring remedial action. These include Deepwater, New Jersey; Tampa, Florida; and Nichols, Florida.



Sequence of Events Leading to Remedial Action

ACTIVITY REMEDIAL ACTION PROGRAM
SUBACTIVITY MED/AEC SITES

LEGEND:
- △ BEGIN MILESTONE
- ▽ END MILESTONE
- ○ DECISION MILESTONE
- ▲ COMPLETED TASK

	CY 1979	CY 1980	CY 1981	CY 1982	CY 1983	CY 1984	CY 1985
	FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984	FY 1985
Engineering Evaluation (Title I) on High-Priority Sites		△——▽					
Remedial Action Engineering Plans (Title II) on High-Priority Sites			△——▽				
Implement Remedial Action on High-Priority Sites			△———	———	———	——▽	
TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	2,810	10,155	14,000				

2.0 GRAND JUNCTION

Between the years 1952 and 1966, several hundred thousand tons of uranium mill tailings were removed from the Climax Uranium Company's mill tailings pile in Grand Junction, Colorado, for use as a construction-related material. However, it was not until 1966 that the Colorado Department of Health and the U.S. Public Health Service discovered that the tailings were being used for construction purposes. At this time the mill was ordered to stop releasing the tailings and investigations relative to the effects of their use as construction-related material were initiated. Investigations were conducted and early in 1970 the U.S. Surgeon General provided guidelines for determining the need for corrective action at the many locations throughout the area at which increased levels of radiation exposure were being experienced as a result of the presence of the tailings.

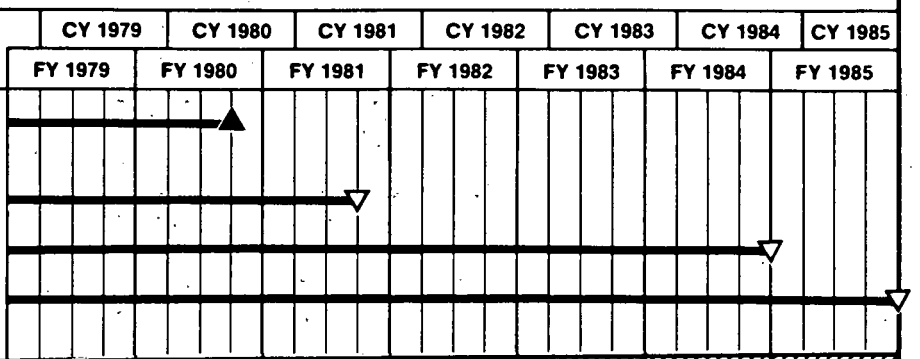
As a matter of compassionate responsibility, the Congress passed Public Law 92-314 in 1972 (later amended by Public Law 95-236) authorizing appropriations to assist the State of Colorado in conducting a remedial action program. The objective of this Remedial Action Program is to perform corrective action in those structures where exposures exceed the Surgeon General's guidelines for radon daughters and gamma radiation.

Status

The program is a State-operated activity with DOE providing 75 percent of the funding and the State 25 percent. To date it is estimated that about 800 structures will require remedial action and about 360 have been done. About 60 structures are done each year and costs have been about $1.5 million per year. The program has a Federal authorization of $9.5 million for a total of $12.67 million. However, the current total estimated cost to complete the program is $21.7 million with the Federal share being $16.275 million. The program is presently scheduled for completion in 1985. The Grand Junction Office is responsible for DOE's efforts and this office maintains close coordination with the AL, the lead field office for the Mill Tailings Remedial Action Program.

ACTIVITY REMEDIAL ACTION PROGRAM
SUBACTIVITY GRAND JUNCTION

LEGEND:
△ BEGIN MILESTONE
▽ END MILESTONE
○ DECISION MILESTONE
▲ COMPLETED TASK

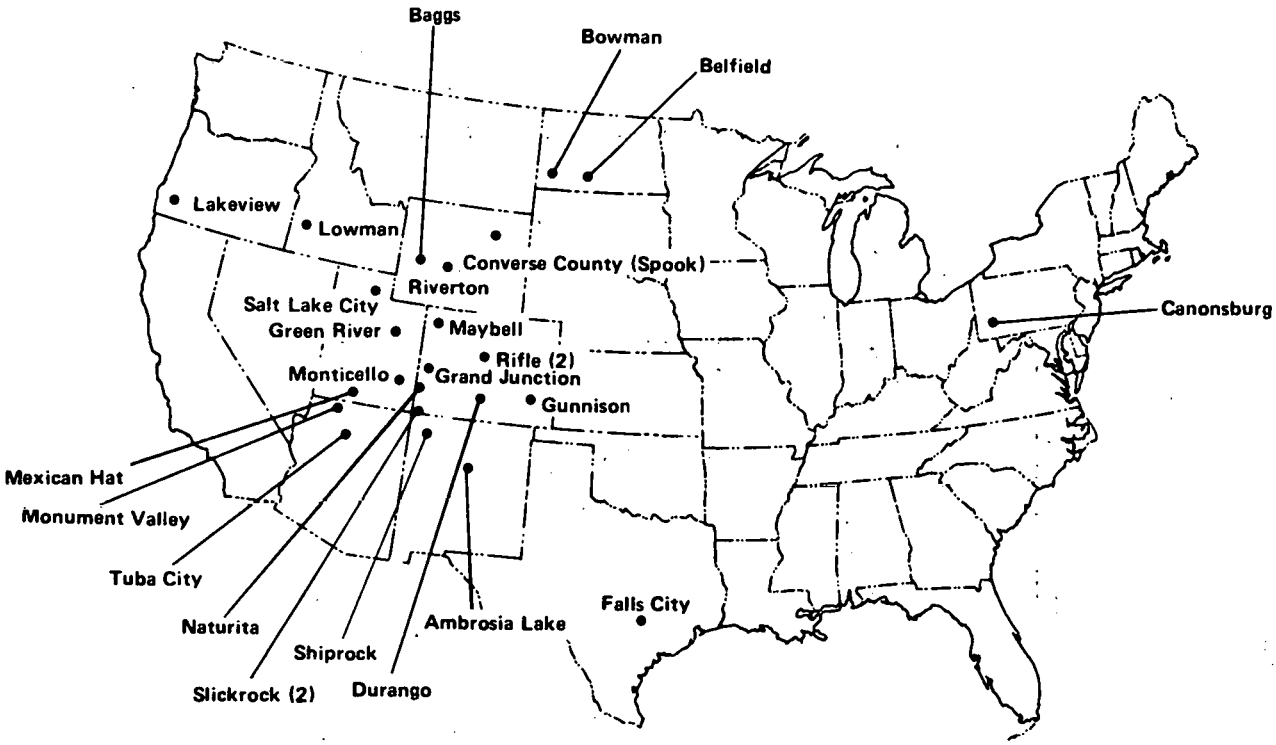


TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	1,500	0	2,000				

3.0 URANIUM MILL TAILINGS

As a result of the situation that developed with the use of uranium mill tailings in structures at Grand Junction, Colorado, the potential for personnel exposure or environmental contamination due to uranium mill tailings piles has been recognized as a concern. Operating mills which are licensed by the NRC or the States are under their cognizance and there is assurance that the tailings control and stabilization will not be neglected. However, there are a number of uranium mill tailings piles in the West at mills that had processed ores only for the AEC, had ceased operations, and were under minimal licensing control or contractual requirement with respect to the tailings. Twenty-one such sites, located in 8 western states and one site in Pennsylvania, were initially identified. In all cases, the tailings were relatively unstabilized, the mills were no longer active, and the companies that still existed had indicated an inability to accept liability for removal of the tailings or their stabilization. What was clearly needed was some authority to allow the situation to be remedied. In April 1978, the DOE proposed legislation to Congress to authorize remedial action. The proposed program was to be a joint Federal-State undertaking similar to the Grand Junction Remedial Action Program.

The actions of Congress resulted in the passage of Public Law 95-604, "The Uranium Mill Tailings Radiation Control Act of 1978," on November 8, 1978. Under this Act the Secretary of Energy, in consultation with the NRC, has designated 25 sites for remedial action; has set priorities for remedial actions with the concurrence of the EPA; will arrange for cooperative agreements with the affected States and Indian nations; and, with the concurrence of the NRC, will carry out the needed remedial actions. The names and locations of the 25 designated sites are shown below.



Inactive Uranium Mill Sites

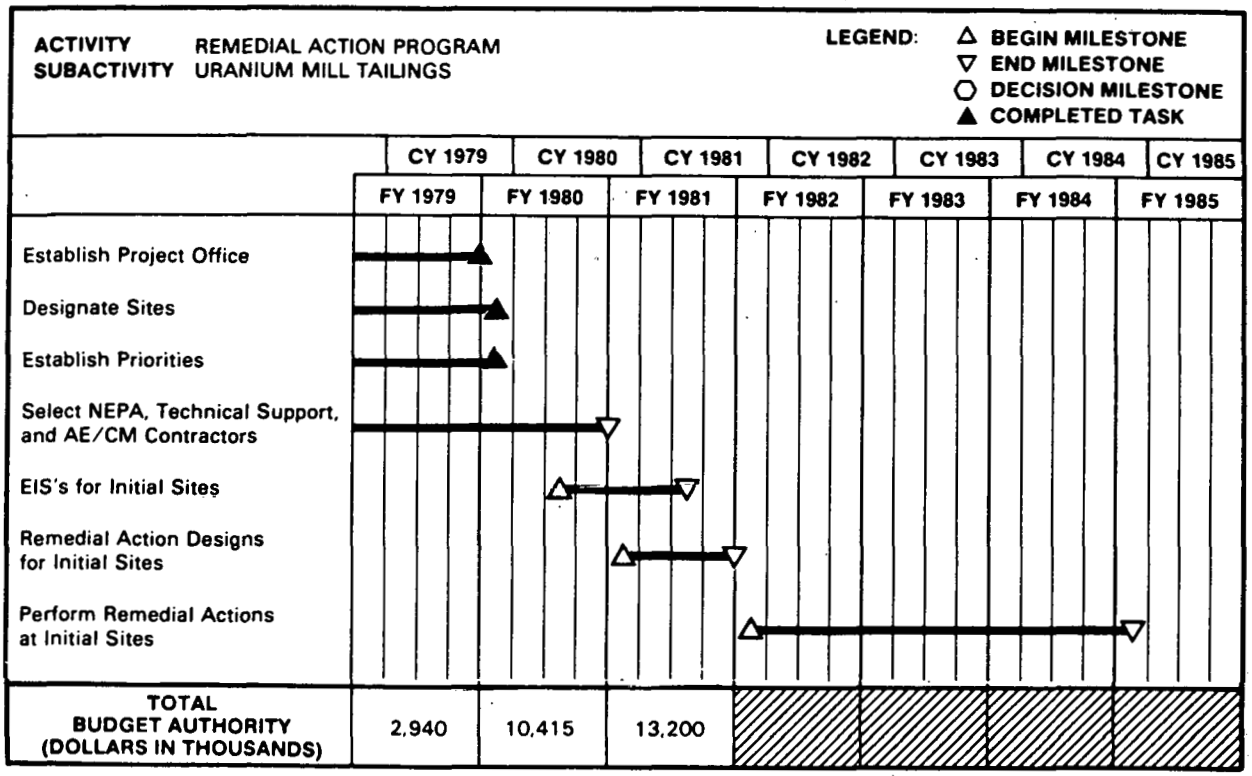
Status

The AL has been designated the lead field office for the Uranium Mill Tailings Remedial Action Program and a Project Office has been established. The selection of lead contractors to provide technical support and A/E services to the Project Office is given highest priority for FY 1980. Also, it is anticipated that the preparation of NEPA documentation will proceed as soon as draft standards and criteria are issued by the EPA, with emphasis on EIS's for the high-priority sites.

In consultation with the EPA, each of the 25 inactive mill tailing sites has been assigned a priority rating of high, medium, or low, as shown on the accompanying table.

Table III-6. Priority for Remedial Actions

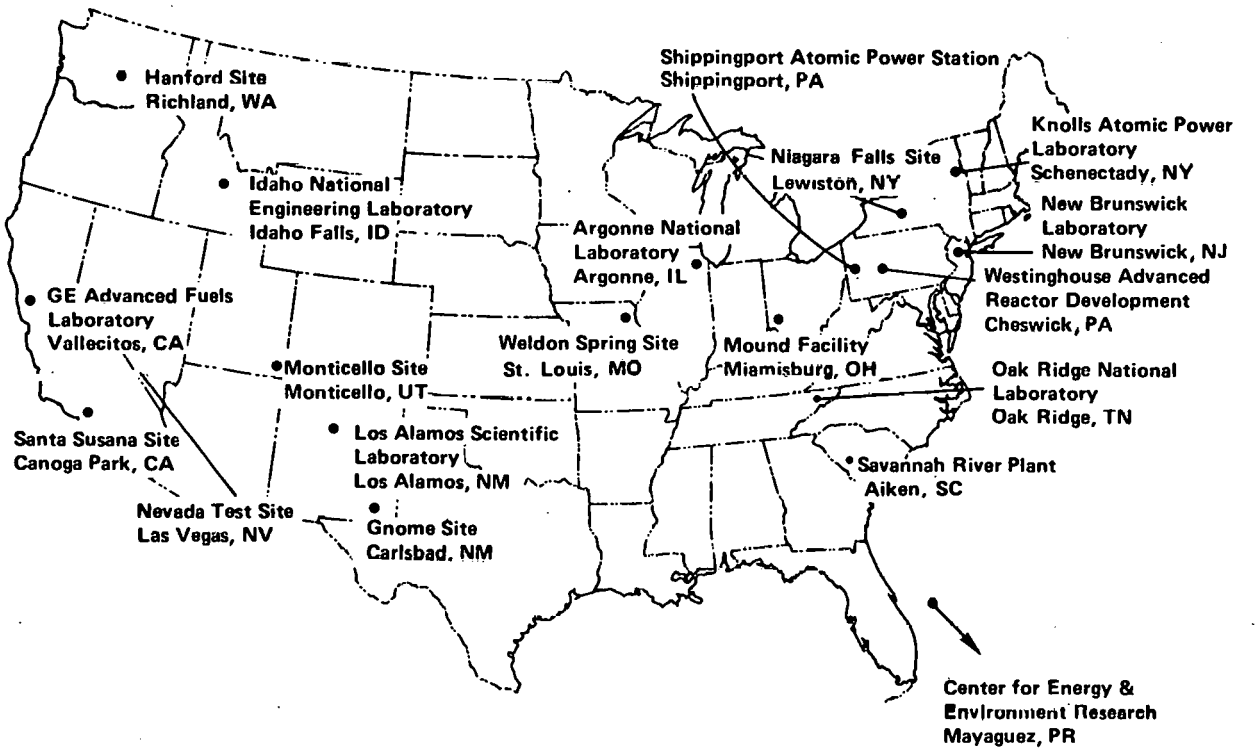
PRIORITY	SITE
HIGH	Salt Lake City (Vitro), Utah Canonsburg, Pennsylvania Durango, Colorado Shiprock, New Mexico Grand Junction, Colorado Riverton, Wyoming Gunnison, Colorado Old Rifle, Colorado New Rifle, Colorado
MEDIUM	Mexican Hat, Utah Lakeview, Oregon Falls City, Texas Tuba City, Arizona Naturita, Colorado Ambrosia Lake, New Mexico
LOW	Green River, Utah Slick Rock (NC), Colorado Slick Rock (UCC), Colorado Maybell, Colorado Monument Valley, Arizona Lowman, Idaho Converse County (Spook Site), Wyoming Baggs, Wyoming Belfield, North Dakota Bowman, North Dakota



The milestones shown on the chart are tentative, pending more detailed planning and scheduling activities to be performed by the AL Project Office. Also, it must be noted that under Public Law 95-604, no remedial action can be performed until criteria and standards have been issued by the EPA. These standards were due on November 8, 1979. The milestones shown are based on an estimated issue date of September 1980. Many of the milestones shown will be delayed on a day-to-day basis if the September 1980 date is not met.

4.0 DECONTAMINATION AND DECOMMISSIONING OF SURPLUS DOE FACILITIES

The DOE has approximately 500 surplus facilities which are radioactively contaminated. The facilities include reactors, fuel processing plants, buildings, tanks, and disposal facilities at sites throughout the United States and Puerto Rico. DOE's objective in this area is to decontaminate these facilities in order to permit other productive uses where possible and at the same time eliminate any potential hazards to the public health and safety and to the environment, and reduce the costs of maintenance and surveillance of the facilities. Disposition of future excess contaminated facilities will also be handled within this subactivity.



Locations of DOE Radioactive Contaminated Surplus Facilities

D&D of Surplus DOE Facilities includes the following elements:

- Surveillance
  - Maintenance
  - Radiation and environmental monitoring

- Planning
  - Identification and definition of planning tasks
  - Site decommissioning plans
  - Set disposition priorities
- Disposition
  - Accomplish disposition of surplus facilities
- Technology
  - Develop technology and transfer results to commercial sector

The Surplus DOE Facilities subactivity is managed as the major part of SFMP. Also included in SFMP is the management of Defense Facilities D&D described in Defense Waste Management. This allows the associated subactivities to be managed under a single program unit thereby expediting coordination and integration of related efforts.

The lead field office for SFMP is the RL Operations Office and the lead contractor is UNC Nuclear Industries who operate an Office of Surplus Facilities Management (OSFM). All of the other field offices participate in this program.

Status

Surveillance

The major funding for the surveillance element is for the 200 Area Facilities at RHO. There are over 300 contaminated facilities including ponds, ditches, trenches, burial grounds, and cribs related to postoperational radioactive waste management. In addition to surveillance and monitoring, stabilization of burial grounds will be accomplished. This stabilization includes removal of contaminated vegetation and soil, installation of a 20-year below ground bio-barrier, and regarding revegetating.

Planning

Detailed plans are being developed for specific sites which identify disposition alternatives and procedures required for implementing the alternatives. An important current effort is the identification of long-term disposition alternatives for uranium residues stored at the Niagara Falls Storage Site near Niagara Falls, New York.

Disposition

The largest disposition effort will be the decommissioning of the Shippingport Atomic Power Station. This project was contained in Defense Facilities D&D in prior years.

The Shippingport Atomic Power Station is a 60 MWe nuclear power plant of the pressurized water type, located on the Ohio River at Shippingport, Pennsylvania. The plant was built for development and demonstration purposes and first achieved criticality in December 1957. It is currently being operated to demonstrate a light water breeder reactor nuclear core for the DOE Water Breeder Reactor Program. The steam portion, i.e., the reactor and related steam-generating facilities, is owned by the DOE. The electrical portion, i.e., the turbine and related electrical-generating facilities, is owned by Duquesne Light Company. Duquesne operates the station, makes payment to the DOE for the steam, and distributes the power produced. Under the terms of the contract, DOE must remove the contaminated equipment after the end of the program. Shutdown is now scheduled for early 1982.

This project is currently scheduled to allow decommissioning operations to be initiated in parallel with shutdown and defueling operations of the reactor plant. Defueling is currently planned to begin following shutdown in FY 1982.

Detailed engineering/design required to decommission the facility will be prepared prior to termination of operations. The result of this effort will be a decommissioning plan identifying alternative decommissioning modes and covering the following:

- Identification and definition of the required work packages
- Detailed procedures required by the work packages
- Special tool/equipment requirements
- Waste volumes, transportation, and disposal requirements
- Occupational radiation exposure
- Environmental effects
- Project schedule, using bar chart and/or activity network to show durations, constraints, and critical path presentations
- Cost estimates for the identified activities, prepared in a format and sufficiently detailed to allow program monitoring of progress and costs at the program level

In addition to this project there are six other major projects which will be undertaken in FY 1981. These decommissioning projects are:

- New Brunswick Laboratory, New Brunswick, New Jersey, managed by the Chicago Operations Office
- Boiling Water Reactor Experiment, INEL
- 100-F Plutonium Production Reactor, Hanford Reservation, Washington
- 233-S Plutonium Concentration Facility, Hanford Reservation, Washington
- Sodium Reactor Experiment, Santa Susana, California, managed by the San Francisco Operations Office
- Weldon Spring Site Raffinate Pits, Weldon Spring, Missouri, managed by the Oak Ridge Operations Office.

Technology

Future D&D of commercial nuclear facilities will be greatly enhanced by a DOE R&D program accompanied by the transfer to private industry of these technological developments. This includes the development of processes and equipment applicable to the decommissioning of nuclear facilities and to the major tasks associated with a specific decommissioning projects.

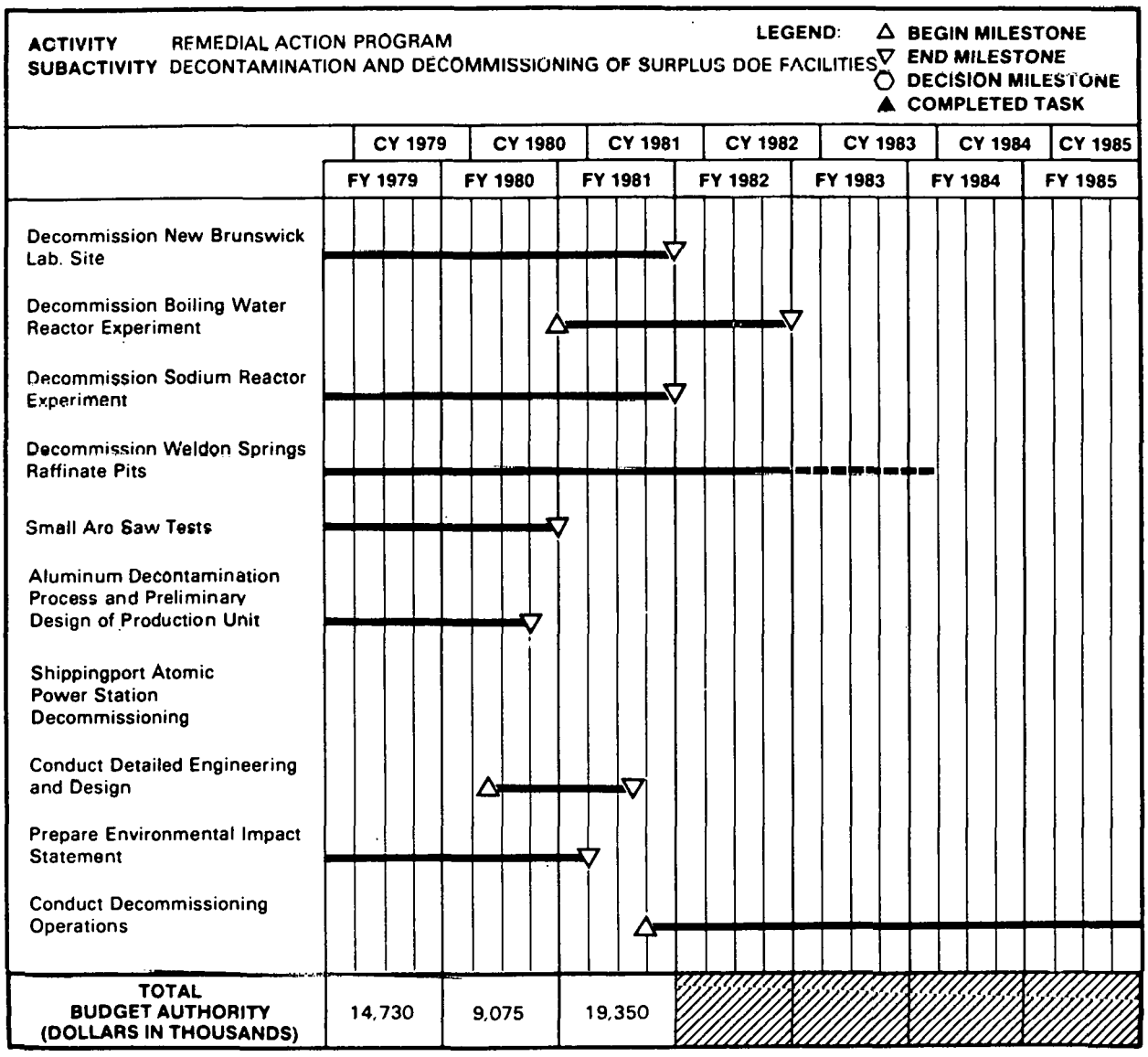
Diverse technologies are required for decommissioning contaminated facilities. Technological requirements include procedures and techniques for:

- Removal of surface contamination from metallic wastes
- Decontamination of structural materials
- Measurement of residual contamination levels in structures, materials, and soils
- Prevention of plant and animal penetration of shallow buried wastes
- Evaluating the integrity of concrete structures
- Size and volume reduction of contaminated metallic equipment
- Stabilization of residues from uranium processing

At present three field operations offices in addition to RL are involved in this subactivity: Oak Ridge (OR), San Francisco (SF), and Savannah River (SR). They are developing products in the following areas:

- Metallic Scrap Recycle - OR
- Material size reduction and surface decontamination - SF
- Instrumentation - RL
- Volume reduction - RL

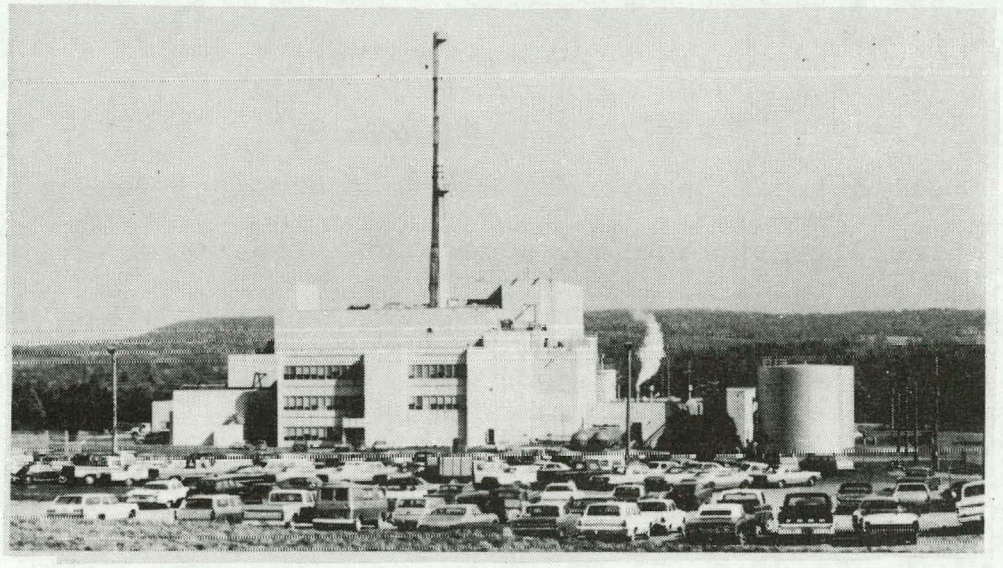
Topical reports and annual progress reports will be prepared on these developments and made available to the private sector. In addition, information is exchanged at professional meetings on D&D.



5.0 WEST VALLEY

The Western New York Nuclear Service Center (WNYNSC) is located in a rural area about 30 miles southeast of Buffalo. The small communities of West Valley, Riceville, Ashford Hollow, and Springville are located within 5 miles of the center. The center's facilities include the only commercial nuclear fuel reprocessing plant ever operated in the United States, a fuel receiving and storage facility, burial areas for solid radioactive wastes, and tanks containing liquid high-level radioactive wastes. The commercial operator of the plant reprocessed fuel from 1966 to 1972. The plant is now maintained in a shutdown condition. The center is located on land owned by New York State and leased by the operator. The terms of the contract between the State and the commercial operator require the State to assume responsibility for the facilities and the wastes when the lease expires at the end of 1980. The State of New York requested, in November 1976, that the Federal Government take over the site.

The reprocessing facility located on the site is shown below.



WNYNSC Nuclear Fuel Reprocessing Facility

Status

In accordance with the FY 1978 Authorization Act, DOE conducted a study to explore technical and institutional options for the possible D&D of this site and possible future continued use. The study report was published for public comment in November 1978 and was transmitted to Congress (Document No. TID 28905, Volumes 1 and 2) with the results of the public review in February 1979.

The FY 1980 Appropriation Act directed DOE to perform the necessary technical activities to study and recommend a project to solidify the liquid HLW stored at the center. The following activities are being initiated to assist in defining the solidification project:

- EIS preparation
- Transportation system study
- Stored waste characterization
- D&D studies and onsite storage of waste
- Waste tank mockup studies
- Site and facility seismic analysis
- Preliminary analysis of solidification process system
- Solidification process system conceptual design
- Facility storage and separation studies

Should DOE receive authority for overall management and execution of the solidification project, the Federal Government is expected to assume the major share of the cost and New York State would share in a proportionate way. Specific cost sharing arrangements between the Federal Government and New York State will be up to the Congress to legislate. The State of New York will arrange for any cost sharing arrangements for its share, as appropriate.

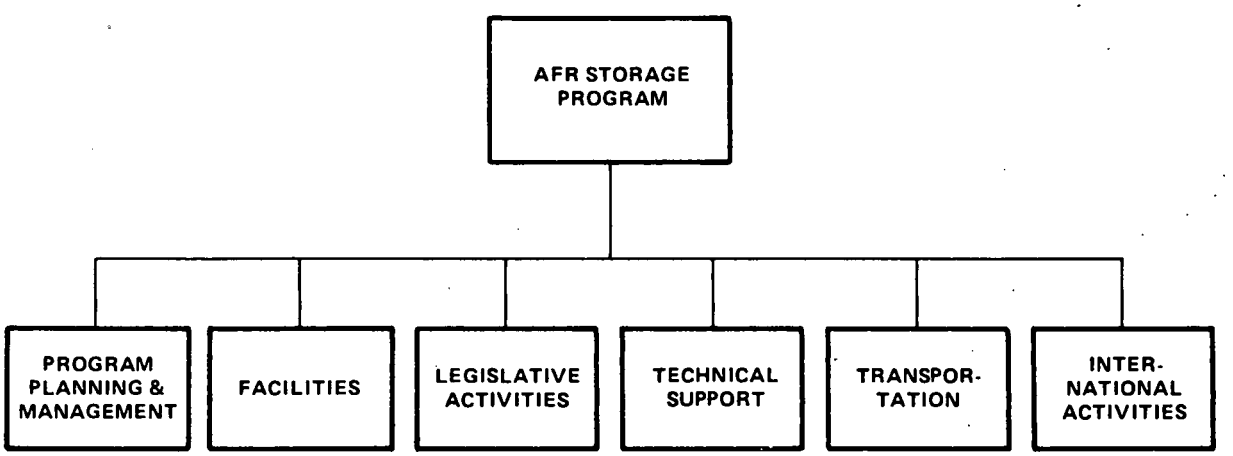
A Draft EIS will be issued in 1QFY 82 to be followed by the final EIS in 1QFY 82. A NEPA document on waste form selection could be issued in 2QFY 84. Subject to Congressional approval, design activities could be initiated in 1981 to be followed by construction activities which would support facility operation beginning in 1987. Solidification process operations could be completed in 1990 with subsequent transport offsite to a Federal repository as soon as feasible. D&D of facilities, materials, and hardware used in connection with the project could be accomplished in 1993.

D. SPENT NUCLEAR FUEL

On October 18, 1977, DOE announced its policy to accept and take title to spent fuel from U.S. nuclear reactors and a limited quantity from reactors located in other countries.

President Carter ordered indefinite deferral of reprocessing of spent fuel in the United States. He also urged other nations to defer reprocessing plans. This deferral will require storage of fuel until a decision to dispose of fuel as waste or a decision to reprocess fuel is made. Pending this decision, retrievable storage is prudent.

The away-from-reactor (AFR) storage program for spent nuclear fuel, in accordance with the announced policy, will provide facilities to store domestic and foreign fuel until final decisions on spent fuel disposition are made. Additionally, the AFR program will support U.S. nonproliferation objectives through cooperative programs which encourage international spent fuel storage. The work organization of these activities is shown below.



AFR Storage Program Activities

The overall program objectives are to:

- Ensure that U.S. nuclear reactors do not shut down because of inadequate storage space
- Establish storage and disposal fees that can be utilized as a basis for determining portions of nuclear fuel cycle costs

- Support U.S. nonproliferation objectives by offering a credible alternative to nuclear fuel reprocessing in foreign nations

The immediate objectives of domestic fuel storage activities are to:

- Plan and manage a program that will provide adequate interim spent fuel storage capacity until geologic storage or reprocessing is available
- Establish full cost recovery fees and contract specifications for DOE storage and disposal services
- Develop technology to increase the capacity of existing spent fuel storage facilities at reactors
- Develop technical information to resolve safety or environmental concerns about spent fuel storage

The immediate objectives of international fuel storage activities are to:

- Develop detailed plans for transfer of some foreign fuel to the United States
- Conduct technical fuel storage studies in conjunction with international organizations or individual countries as required to encourage international fuel storage
- Provide limited direct storage assistance to foreign countries to encourage fuel storage
- Augment, as appropriate, domestic fuel storage activities to ensure that information and facilities necessary to support international activities are available as needed

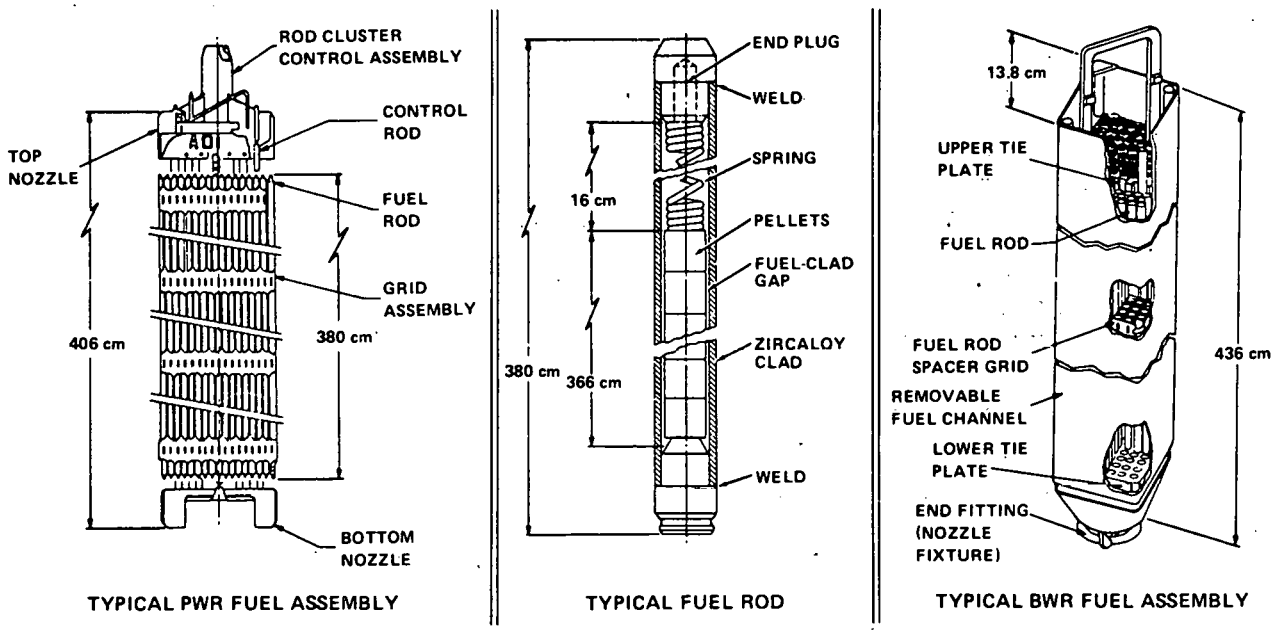
1.0 DOMESTIC SPENT FUEL STORAGE

The provision of AFR storage space for spent fuel is based on the policy that the utilities must pay for the fuel storage and disposal services provided. The program will determine the cost to the Government to provide this service and the method of collecting the fee that best meets the goals of the program. Criteria for establishing the fee are:

- Full recovery of the Government's costs
- Payment of the fee by the people who use the services
- Encouragement of at-reactor storage
- Minimal Government outlays
- Minimal cost to the rate payer
- No residual fuel value unless a decision is made to retrieve and reprocess the fuel

The DOE FY 1981 program plans to provide storage capacity in 1983 consistent with the shale fuel policy approved by the President and the recommendations of the IRG report. The initial storage mode will provide for retrievability of the spent fuel.

The following figure shows typical LWR fuel assemblies.

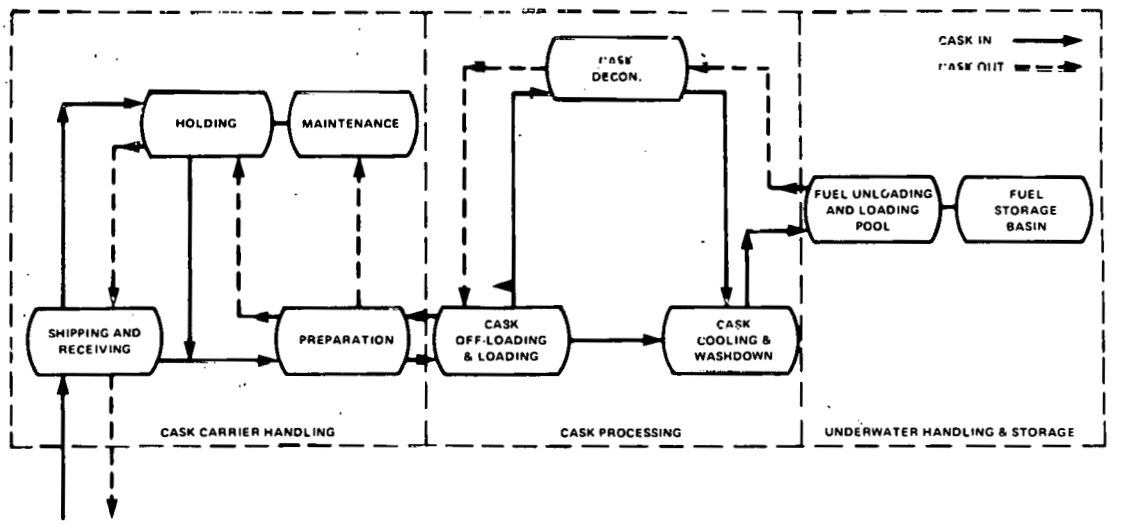


Typical LWR Fuel Assemblies

1.1 Program Operations, Management, and Support

Many of the aspects of spent fuel storage are applicable to both domestic and international fuel disposal activities. These activities include the establishment of storage charges, U.S. legislation, and acquisition of a facility. Since greater requirements are currently expected for the utilization of spent fuel storage facilities for domestic fuel, most of the funding and effort in FY 1981 is directed toward that part of the activity. This is supplemental, wherever necessary, to support the unique aspects of the international spent fuel storage.

The figure below shows a flow diagram for the handling and storage of spent fuel.



Spent Fuel Handling and Storage

Program planning and management include studies and analyses that will be performed to provide the basis for the development of spent fuel disposal policy and business and financial arrangements and to delineate general requirements. This task includes the development of program plans and the establishment of a spent fuel storage fee.

Facilities activities provide for the acquisition of spent fuel storage capabilities in 1983, including the use of existing facilities and their expansion. These activities will be carried out concurrently until the selection of the appropriate option or options to satisfy specific program needs. In particular, contingency storage at existing facilities to meet critical near-term requirements will be investigated.

Legislative requirements provide for the definition of and compliance with existing requirements and the development of

supporting legislative actions. A significant fraction of this effort will be directed toward the GEIS's as required and the accomplishment of congressional study requirements.

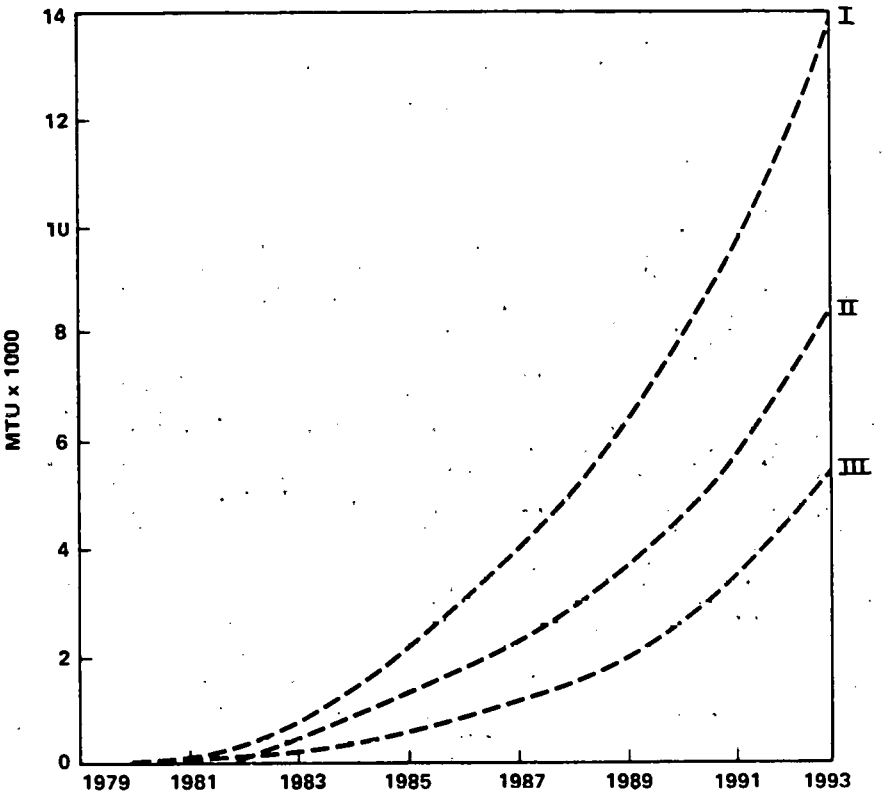
Technical support involves provision of technical support for spent fuel storage technology development. This includes improvements in the efficiency and capacity of reactor storage basins, and the development of concepts other than water basin storage. Technical support also includes safety and environmental studies to improve calculational techniques and models used to assess the safety and the environmental impacts of the storage basin. Advanced storage technology studies on dry storage and fuel pin storage will be performed and will include criticality and shielding investigations.

Transportation activities provide the planning and analysis required to ensure that an adequate transportation system is available to allow the movement of spent fuel from the reactor sites to the AFR storage facilities and subsequently to the final disposal site. The policy provides that transportation to the AFR storage facility is the responsibility of the utilities.

Status

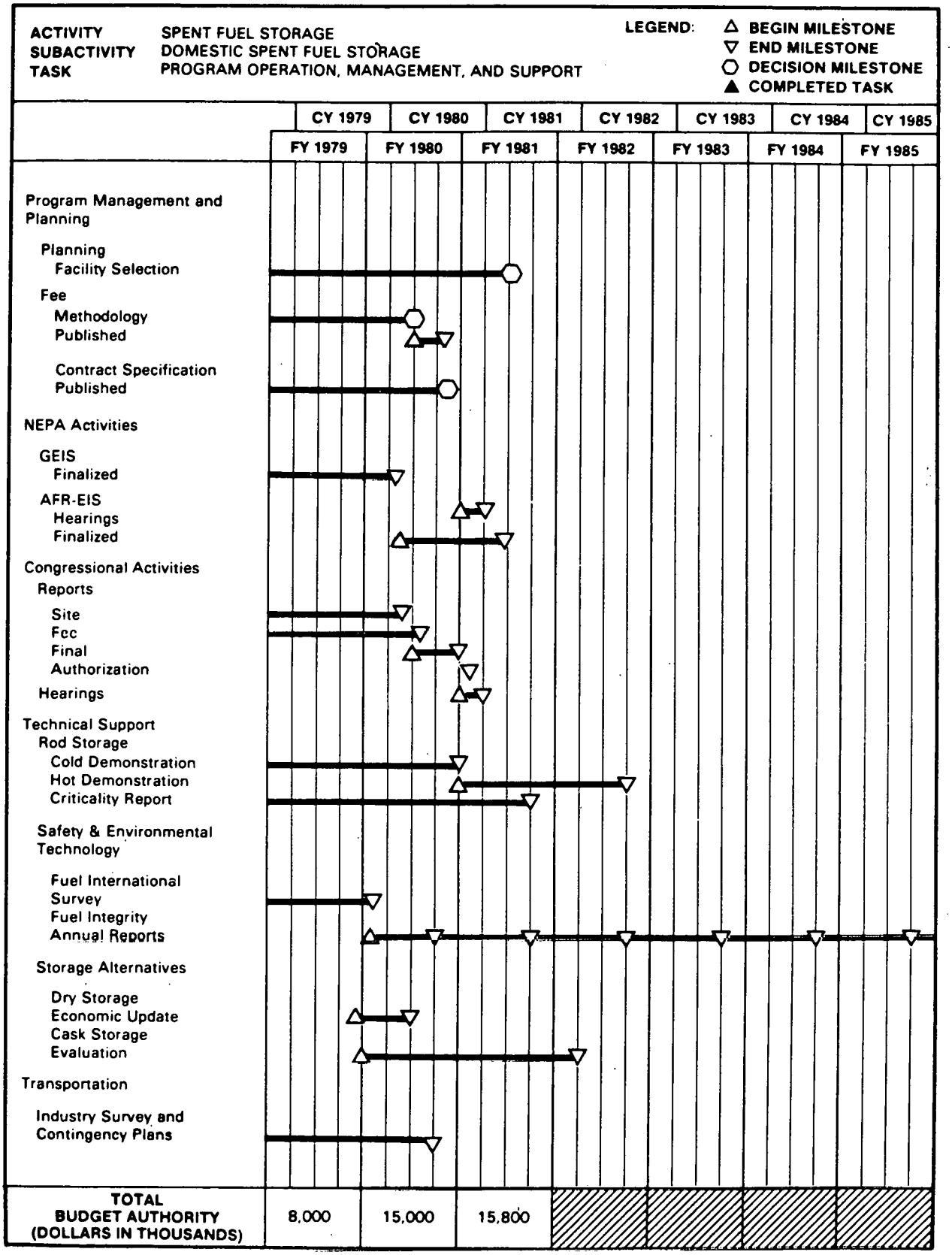
Many utilities are facing a shortage of spent fuel storage capacity. In some cases this can be alleviated by more compact racking of their basins. In other cases transfers of fuel from one basin to another within their own system are possible. While the increased storage basin capacities will provide relief for some utilities, others will face the prospect of inadequate storage with no immediate solution. Estimates of the actual transfers DOE will receive vary significantly.

As part of its continuing effort to assess spent fuel storage requirements and capabilities, DOE has developed a system for assessing storage and transportation requirements for a variety of assumptions. This information is kept current with utility plans. Based upon utility plans as of June 1, 1979, limited transshipments of spent fuel within the utilities, and maintaining full core reserve, DOE is using as a planning base the requirements shown in the following figure.



I. Current expansion plans -- Upper bounds no transshipment
II. Maximum expansion -- Base case no transshipment
III. Maximum expansion -- Lower bound intra-utility transshipment

Cumulative Spent Fuel Storage Requirements

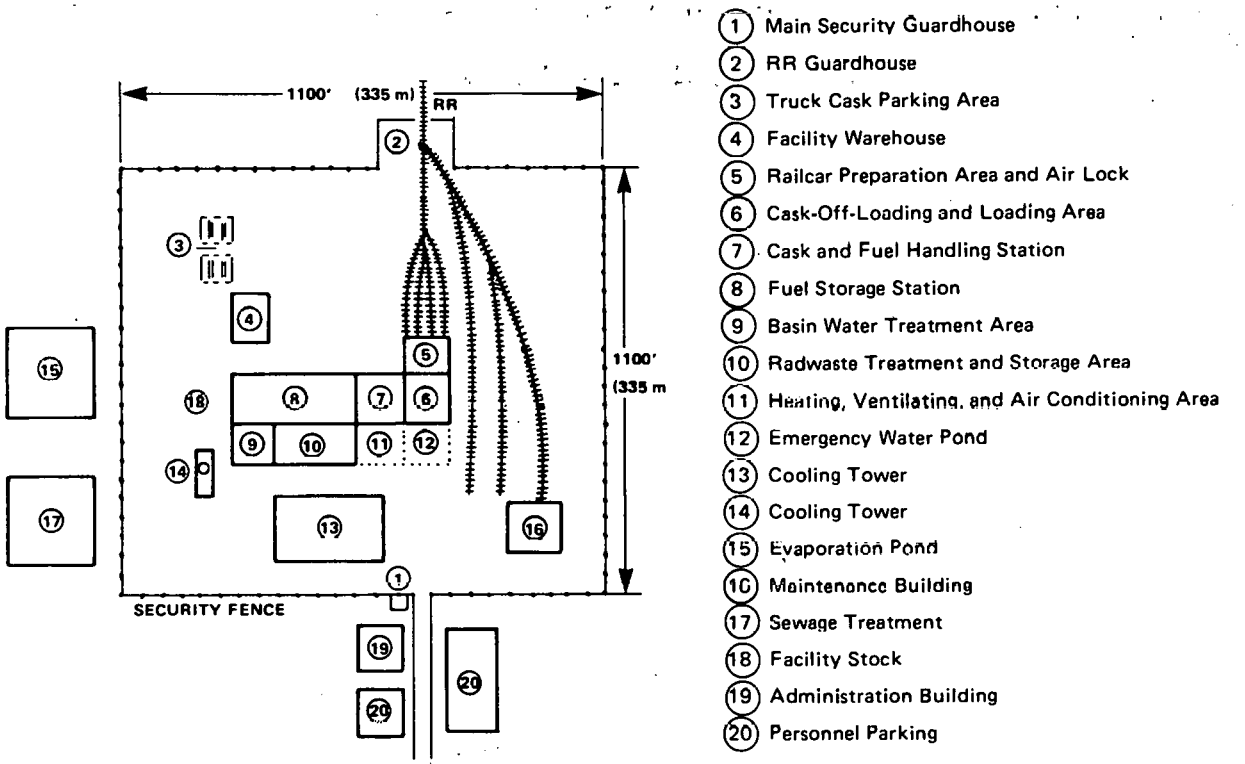

ACTIVITY SPENT FUEL STORAGE
SUBACTIVITY DOMESTIC SPENT FUEL STORAGE
TASK PROGRAM OPERATION, MANAGEMENT, AND SUPPORT
LEGEND:
BEGIN MILESTONE
END MILESTONE
DECISION MILESTONE
COMPLETED TASK
CY 1979
CY 1980
CY 1981
CY 1982
CY 1983
CY 1984
CY 1985
FY 1979
FY 1980
FY 1981
FY 1982
FY 1983
FY 1984
FY 1985
Program Management and Planning
Planning
Facility Selection
Fee
Methodology Published
Contract Specification Published
NEPA Activities
GEIS
Finalized
AFR-EIS
Hearings
Finalized
Congressional Activities
Reports
Site
Fee
Final
Authorization
Hearings
Technical Support
Rod Storage
Cold Demonstration
Hot Demonstration
Criticality Report
Safety & Environmental Technology
Fuel International Survey
Fuel Integrity
Annual Reports
Storage Alternatives
Dry Storage
Economic Update
Cask Storage
Evaluation
Transportation
Industry Survey and Contingency Plans
TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)
8,000
15,000
15,800

1.2 Away-From-Reactor Storage Facilities

Despite utility actions to increase storage capacity at the reactor sites, some utilities find it necessary to ship spent fuel offsite. Under the Spent Fuel Policy, the Federal Government would accept this fuel and provide for its storage at AFR storage facilities.

Although a number of concepts have been studied for AFR storage, current interest has focused on storage of uncanistered fuel in an open water basin constructed of concrete with a stainless steel liner, a concept which has been used successfully for over 30 years in Government and commercial applications. All DOE AFR facilities are expected to be licensed.

The figure below shows a typical plot plan for a conceptual AFR installation.



Conceptual AFR Pilot Plan

Status

The expected AFR storage requirements may be met by the use of existing facilities, the construction of new facilities, or a

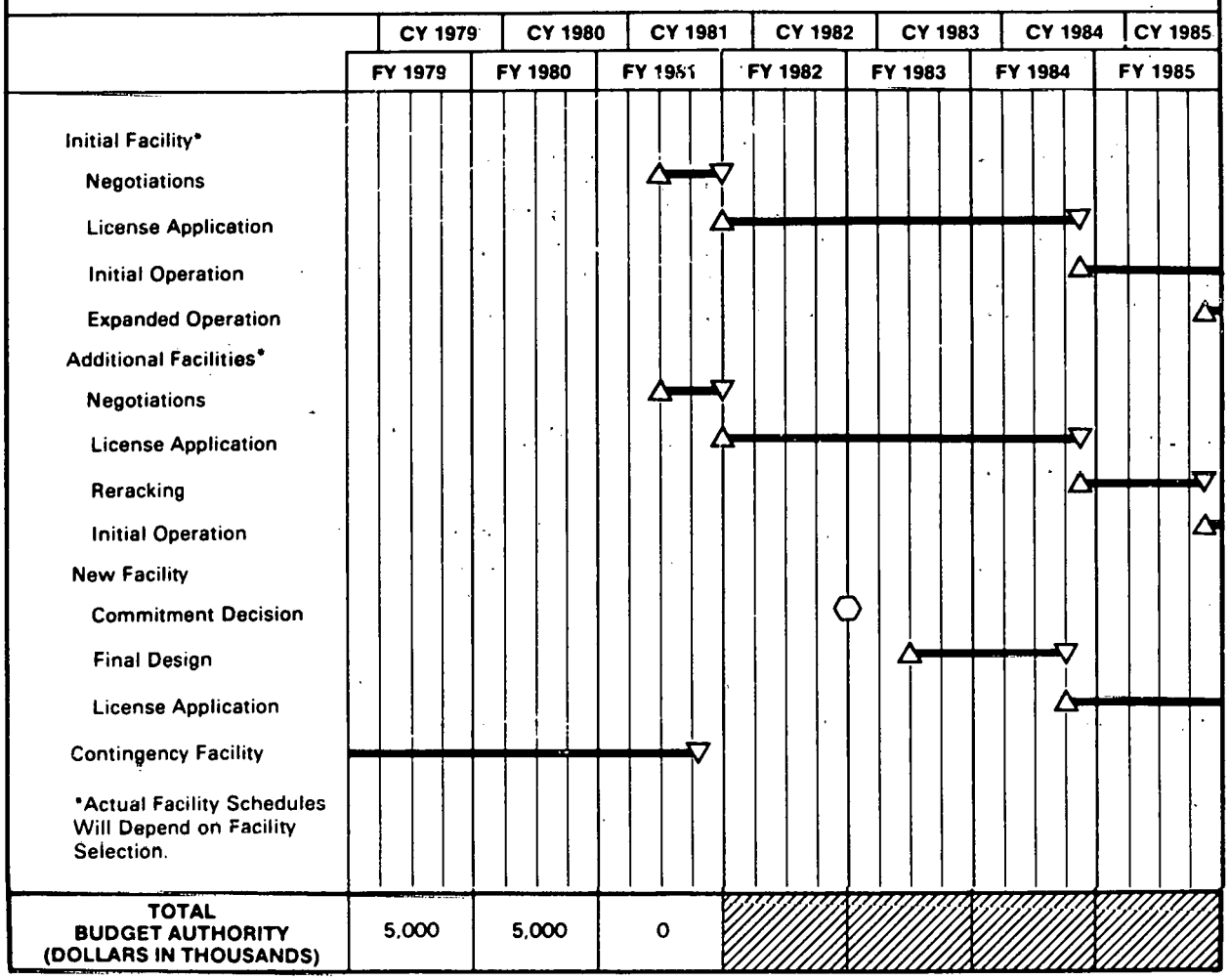
combination of both. Below are possible options for AFR storage capacity.

- The Allied-General Nuclear Services (AGNS), Barnwell Facility
- The Nuclear Fuel Services Inc. (NFS) West Valley Facility
- The General Electric (GE) Company, Morris Creek Facility
- A new facility at an unspecified site

The licensing and construction schedule for a new facility is such that capacity could not be provided until the late 1980's; therefore, any capacity provided between 1983 and that time must be provided by existing facilities. Upon legislative authorization, DOE will attempt to acquire those existing facilities required and acceptable, as determined by the "AFR Spent Fuel Storage EIS" which will be prepared following finalization of the three legislative EIS's.

ACTIVITY SPENT NUCLEAR FUEL
SUBACTIVITY DOMESTIC SPENT FUEL STORAGE
TASK AWAY-FROM-REACTOR STORAGE FACILITIES

LEGEND:
△ BEGIN MILESTONE
▽ END MILESTONE
○ DECISION MILESTONE
▲ COMPLETED TASK



TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	5,000	5,000	0				

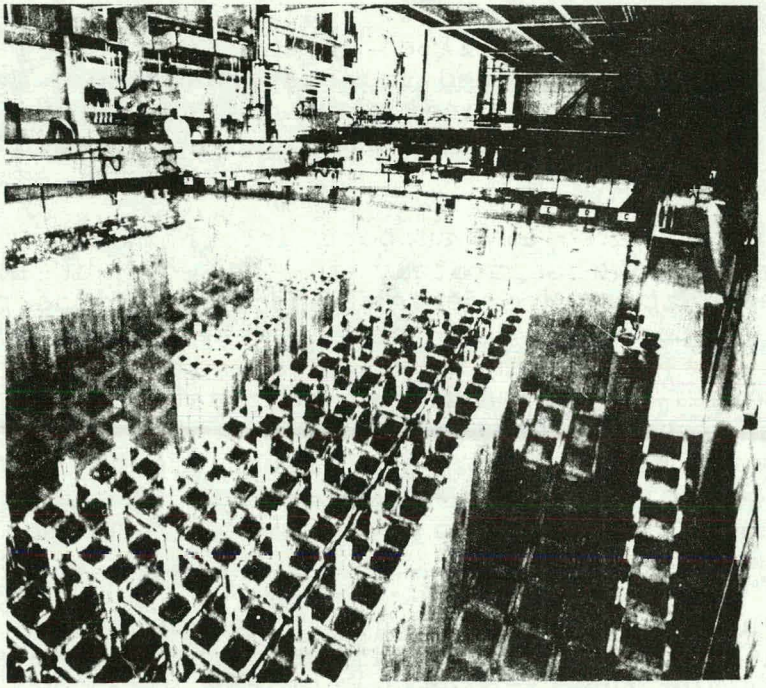
2.0 INTERNATIONAL SPENT FUEL STORAGE

International program objectives are broadly supported by all the work categories identified in the figure on page 175. In particular, facilities acquired to accept and store domestic fuel will be available to store foreign fuel. Similarly, fees developed for domestic fuel storage will be applicable to foreign fuel.

Activities which solely support international fuel storage or transport are shown separately in the work breakdown structure. These activities are defined and adjusted as necessary to support U.S. nonproliferation objectives. Currently planned activities include development of detailed fuel transfer plans for some countries, participation in multinational storage facility studies and dissemination, and exchange of international storage information. Plans and arrangements for assisting individual countries will be made as required. Such plans/arrangements are generally classified; further discussion is inappropriate.

Through interaction with other Government agencies (e.g., U.S. Department of State), DOE will continue assessment of the quantity of foreign fuel the United States will receive. As an integral part of the Transportation Technology Center's activities, transportation systems and regulations for foreign fuel will be reviewed to ensure that fuel can be transported when necessary and test systems will be in place.

The following figure shows spent fuel stored in a pool.



Fuel Storage Pool

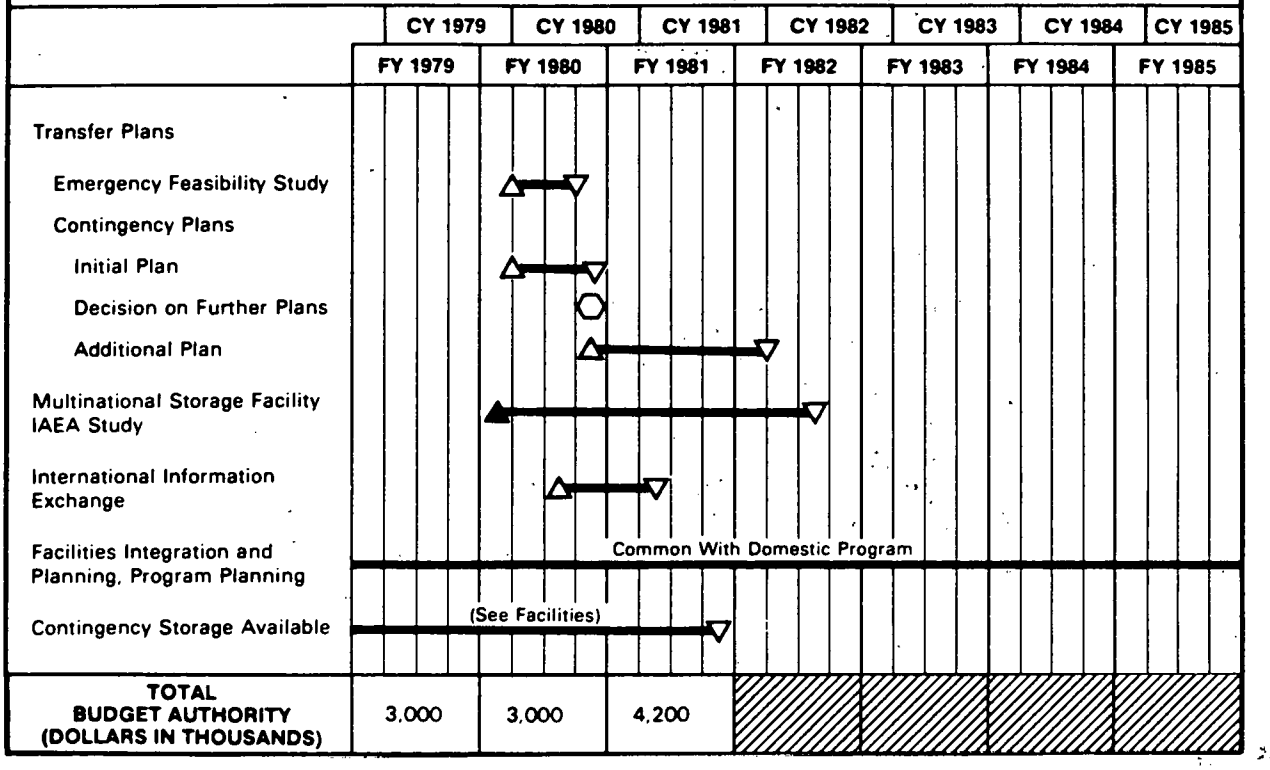
Status

A feasibility study for reracking a foreign reactor storage pool in a developing country and a general feasibility study for multinational storage facilities were completed. Studies are in progress to develop fuel transfer plans for specific countries. Facility acquisition activities and technical support studies which support the international fuel storage are continuing.

Participation in international cooperative studies (such as Behavior of Fuel Assemblies in Storage (BEFAST) Committee) is a continuing part of the program.

ACTIVITY SPENT NUCLEAR FUEL
SUBACTIVITY INTERNATIONAL SPENT FUEL STORAGE

LEGEND: △ BEGIN MILESTONE; ▽ END MILESTONE; ○ DECISION MILESTONE; ▲ COMPLETED TASK



TOTAL BUDGET AUTHORITY (DOLLARS IN THOUSANDS)	3,000	3,000	4,200				

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IV. FIELD ACTIVITIES

The Government's Nuclear Waste Management Program has been a geographically decentralized program since its inception under the Manhattan Project. Each Government site has primary responsibility for management of the wastes generated at that site.

The responsibilities of U.S. Department of Energy (DOE) Headquarters personnel include development of overall plans, establishment of priorities, and completion of analyses to ensure that programs are coherent, goal-oriented, and related to the National Energy Act (NEA), National Energy Plan (NEP), and other plans and legislation. In addition, efforts are directed toward developing the overall budget, guiding DOE's programs through Congress, and then assessing the adequacy and progress of the approved efforts to meet the stated goals and objectives.

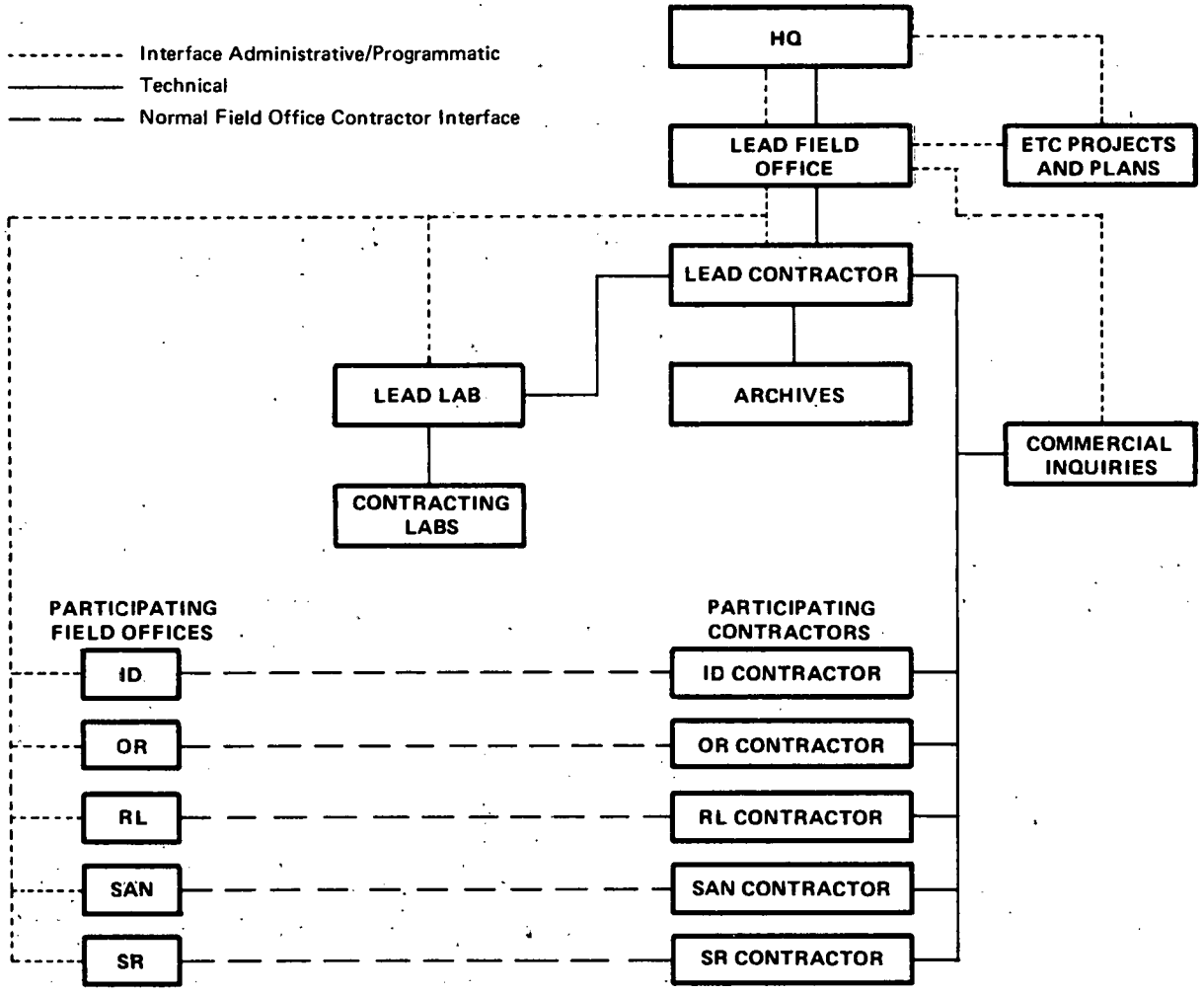
Under the DOE policy of decentralization, day-to-day project management is the responsibility of field offices. Detailed management of projects includes the management of resources to accomplish a given objective within prescribed dollar, performance, and schedule constraints. Specific field office authority and responsibility are detailed in a program agreement which is approved by Headquarters.

In addition, the management of waste technology development programs has been decentralized to lead field offices and contractors. The lead field offices provide technical program management, such as the preparation of program plans and strategy documents, in specified technology areas. Each lead office also has primary responsibility for the preparation of public participation plans. Lead field offices and contractors are listed in Table IV-1.

Table IV-1. Lead Field Offices and Contractors

TECHNOLOGY AREA	LEAD FIELD OFFICE	CONTRACTOR
HLW	SR	Du Pont
TRU	AL	Rockwell
LLW	ID	EG&G
Airborne	ID	ENICO
D&D	RL	UNI
Waste Isolation	RL	Battelle Columbus
Spent Fuel	SR	Du Pont
Transportation	AL	Sandia

The following figure illustrates the interface between Headquarters, field offices, and lead contractors. This interface provides the foundation for decentralization.



Interface Between Headquarters, Field Offices, and Lead Contractors

A. DOE LABORATORIES

The national and engineering laboratories traditionally have played important roles in achieving goals in the waste management program. They have provided solutions to research and development (R&D) problems affecting the technical and economic feasibility and the timetable of nuclear energy activities. In addition to the performance of inhouse research and development at each installation, their personnel have functioned in liaison and supervisory capacities for the management of subcontractors such as universities, other laboratories, and industrial organizations. The laboratories are staffed with scientists, engineers, and technicians with long histories of accomplishments in research, development, and demonstration (RD&D) in nuclear energy. New ideas and processes evolve from these laboratories.

Argonne National Laboratory

Argonne National Laboratory (ANL), located in Argonne, Illinois, is operated by the University of Chicago. Argonne participates in the waste management R&D program in the following areas: technology for converting high-level waste (HLW) to forms suitable for permanent disposal, criteria for converting the cladding-hull waste from fuel reprocessing to a form suitable for permanent disposal, and studies of the potential for the migration of transuranic (TRU) elements through various soils and geologic media.

Brookhaven National Laboratory

Located in Upton, New York, Brookhaven National Laboratory (BNL) is operated by Associated Universities of New York. Brookhaven's contribution to the waste management program consists of R&D on the removal of tritium from effluents and its conversion to a solid form suitable for permanent disposal.

Hanford Engineering Development Laboratory

Hanford Engineering Development Laboratory (HEDL) is in Richland, Washington, and is operated by Westinghouse Electric Corporation. HEDL's role in the Waste Management Program is R&D on processes for solidifying liquid wastes other than HLW and for treating TRU-contaminated solid waste by acid digestion to reduce its volume. HEDL also operates facilities for testing high-efficiency filters for removing particulates from gaseous effluents.

Idaho National Engineering Laboratory

Idaho National Engineering Laboratory (INEL) is located near Idaho Falls, Idaho. Facilities at the site are operated by Edgerton, Germeshausen and Grier Corporation (EG&G), Exxon Nuclear Idaho Company (ENICO), and others. Activities include the development of techniques and the evaluation of the impact of recovering previously buried TRU-contaminated waste, the investigation of alternatives for the long-term management of the buried TRU waste, the development of technology for the conversion of Idaho HLW to a form suitable for permanent disposal, and the selection of an alternative for implementing the long-term HLW management program.

Lawrence Livermore Laboratory

Lawrence Livermore Laboratory (LLL), located in Livermore, California, is operated by the University of California. LLL's activity consists of R&D to improve the performance and reduce the cost of particulate filtration systems.

Los Alamos Scientific Laboratory

Located in Los Alamos, New Mexico, Los Alamos Scientific Laboratory (LASL) is operated by the University of California. LASL's role in the technical program for reducing the volume of TRU-contaminated waste consists of testing incinerators and other volume-reduction equipment under conditions representative of plant operations. LASL also is developing techniques for the long-term evaluation of TRU-contaminated waste burial grounds. In addition, LASL's waste management program includes R&D on methods for testing high-efficiency particulate filters and improved methods for the siting, operation, and long-term stabilization of shallow land burial grounds for the disposal of low-level waste (LLW).

Mound Facility

Mound Facility is located in Miamisburg, Ohio, and is operated by Monsanto Research Corporation. The Mound Facility is developing ultrafiltration technology for application in decontaminating non-high-level liquid waste and is doing R&D on volume-reduction systems for TRU-contaminated waste.

Oak Ridge National Laboratory

Oak Ridge National Laboratory (ORNL), located in Oak Ridge, Tennessee, is operated by Union Carbide Corporation. ORNL participates in the Waste Management Program, specifically in: (1) studies for volume-reduction, packaging, and disposal of high-level, ORNL intermediate-level, TRU-contaminated, and tritium-contaminated wastes by various techniques; and (2) fuel-cycle analysis to determine quantities and characteristics of waste generated under various technology assumptions.

Pacific Northwest Laboratory

Pacific Northwest Laboratory (PNL) is located in Richland, Washington, and operated by Battelle Memorial Institute. PNL has responsibilities for vitrification of HLW; development of waste management concepts and methods, monitoring risk assessment procedures, and preparation of Generic Environmental Impact Statements (GEIS's); and implementation of international program support plans.

Rockwell Hanford Operations

Located in Richmond, Washington, Rockwell Hanford Operations (RHO) is operated by Rockwell International Corporation. RHO's waste management activities include the development of technology for conversion of Richland HLW into a form suitable for permanent disposal, the selection of an alternative for implementing the long-term HLW management program, and the investigation of alternatives for the long-term management of Hanford-contaminated soils and sediments.

Rocky Flats

Rocky Flats (RF), located in Golden, Colorado, is operated by Rockwell International Corporation. RF's primary R&D activity in waste management consists of investigating the fluidized-bed incinerator concept for TRU waste treatment.

Sandia Laboratories

Sandia Laboratories (SL) is located in Albuquerque, New Mexico, and is operated by Western Electric Company. Sandia was the principal contractor in the Waste Isolation Pilot Plant (WIPP) program. Technical activity focuses on the selection of a specific site. Sandia's role includes exploratory drilling and the highly detailed studies necessary for site conformation. In addition, Sandia participates in the gaseous-waste management program and is responsible for evaluating alternative long-term storage facility concepts for krypton-85. Sandia has lead responsibility for management of transportation activities and will establish a Transportation Technology Center. Through its Transportation Technology Center, Sandia will ensure that technical, institutional, and operational problems are addressed and that hardware is available when required.

Savannah River Laboratory

Located in Aiken, South Carolina, Savannah River Laboratory (SRL) is operated by E. I. Du Pont de Nemours and Company. SRL's activities in the waste management program consist of developing technology for the conversion of Savannah River's (SR's) HLW to a form suitable for permanent disposal and conducting studies

related to minimizing potential radionuclide migration from shallow land burial grounds that are in a humid environment. SRL has a major role in the Spent Fuel Storage subactivity in the area of technical management.

The laboratory is preparing the Environmental Impact Statement (EIS) for implementation of the spent-fuel storage policy. In addition, R&D is being conducted to increase spent-fuel storage capacity at existing basins. Alternative away-from-reactor (AFR) storage concepts are being evaluated.

B. UNIVERSITIES

Universities are important to the Waste Management Program as a source of ideas, people, and consulting services, and as contractors and subcontractors in the execution of the waste management technology programs. The universities participate in DOE's Waste Management Program in several ways and at different programmatic levels. The Government-owned laboratories that participate in the Waste Management Program and are operated by universities or university associations are shown in Table IV-2.

Table IV-2. Government-Owned Laboratories Operated by Universities or University Associations

LABORATORY	UNIVERSITY OPERATOR
Argonne National Laboratory	University of Chicago
Brookhaven National Laboratory	Associated Universities of New York
Lawrence Berkeley Laboratory	University of California
Lawrence Livermore Laboratory	University of California
Los Alamos Scientific Laboratory	University of California

Other universities participating in the DOE Waste Management Program are listed below:

Alfred University
Colorado School of Mines
Colorado State University
Cornell University
Harvard University
Idaho State University
Indiana University
Louisiana State University
Montana Technical University
New Mexico Highlands University
New Mexico State University
North Carolina State University
Oregon State University
Stanford University
University of Arizona
University of California - Davis
University of California - Irvine
University of Florida
University of Idaho
University of Miami
University of Minnesota
University of Missouri
University of New Mexico
University of Southern Mississippi
University of Tennessee
University of Texas at Austin
University of Utah
Washington State University
Wright State University

C. INDUSTRY

Participation by industry includes operation of major Government facilities, major subcontracts for waste management activities, and procurements for design, construction, equipment, supplies, and services.

The major Government-owned facilities participating in the Waste Management Program and operated by industry are listed in Table IV-3.

Table IV-3. Government-Owned Facilities Operated by Industry

FACILITY	INDUSTRY OPERATOR
Hanford Engineering Development Laboratory	Westinghouse Electric Corp.
Idaho National Engineering Laboratory	Edgerton, Germeshausen, and Grier Corp.; Exxon Nuclear Idaho Co.; and Others
Mound Facility	Monsanto Research Corp.
Oak Ridge National Laboratory	Union Carbide Corporation
Office of Nuclear Waste Isolation	Battelle Memorial Inst. (nonprofit)
Pacific Northwest Laboratory	Battelle Memorial Inst. (nonprofit)
Rockwell Hanford Operations	Rockwell International Corp.
Rocky Flats	Rockwell International Corp.
Sandia Laboratories	Western Electric Co.
Savannah River Laboratory	E.I. Du Pont de Nemours and Co.

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V. COMMERCIALIZATION

One of the objectives of waste management research and development (R&D) activities is to promote development of highly reliable technology that can be produced at prices competitive with other equipment industries. For technologies related to the management of radioactive wastes, Government control of the commercialization process is considered necessary for reasons of national policy. This control eventually leads to Government management of the operation of commercial-scale facilities and somewhat protracts the progress typically attributed to free market commercialization, while substantially improving systemwide quality assurance.

The management of radioactive wastes is primarily a multiple barrier engineering safety program directed toward protecting people and the environment from exposure to toxic and radioactive wastes. The long-term nature of the hazard represented by some of these wastes makes it imperative that the public health and safety be fully protected for extended periods. Federal control of waste management to ensure such protection is discussed in Section B, following a brief review of the technology development process in Section A.

A. THE TECHNOLOGY DEVELOPMENT PROCESS

The technology development process for the Assistant Secretary for Nuclear Energy (ASNE) and for the waste management program consists of several phases. The first phase consists of basic research in which fundamental studies are performed to advance waste management scientific knowledge. These theoretical and conceptual studies lead to applied research and exploratory development programs that investigate first order problems which surface from the basic research.

After conceptual designs are formalized, efforts are initiated to verify the technical feasibility of a particular waste management technology and to formulate alternative approaches. The design and testing of pilot plants follow with emphasis on engineering and systems analysis.

Successful pilot plant experience leads to construction and operation of a full-scale demonstration facility to exhibit the acceptability of the technology in an operating environment. The final step is full-scale implementation of the technology in regular facilities controlled by the Government and operated by contractors on a routine basis under Government supervision.

The progress of a technology through the development cycle requires major decisions regarding the readiness and suitability of a candidate technology to enter the phases of technology development, engineering development, demonstration, and commercialization. The process by which these four major decisions are made depends on whether the technology requires Government control. For waste management, Government control is required by law (see Section B).

B. FEDERAL CONTROL OF RADIOACTIVE WASTE MANAGEMENT

The Energy Reorganization Act of 1974 (Public Law 93-438) gives the U.S. Nuclear Regulatory Commission (NRC) responsibility for controlling nuclear waste management through regulation. This law also gives the U.S. Department of Energy (DOE) responsibility for R&D and for operational tasks in managing radioactive waste. Although current plans require control of waste management by the Government, they anticipate participation by private industry in parts of the Waste Management Program. Areas that can be delegated to private industry without endangering the public interest are determined by DOE. Some areas that are likely to satisfy Federal law and public concern for adequate protection are as follows:

- Transportation of radioactive wastes. This is currently done almost exclusively by private companies that are required to conform to Federal regulations. Regulations will be modified as necessary to reflect technological advances.

- Management of specific facilities and operations under contract to the Government.

VI. ENVIRONMENTAL IMPLICATIONS

A. OBJECTIVES OF THE WASTE MANAGEMENT PROGRAM

The fundamental purpose of the U.S. Department of Energy (DOE) Waste Management Program is to ensure that radioactive wastes from the nuclear fuel cycle and other DOE programs will be managed in a way that fully protects the public health and welfare, and does not significantly damage the environment. The draft "Generic Environmental Impact Statement (GEIS) on Management of Commercially Generated Radioactive Waste" (DOE/EIS-0046-D), published by DOE in April 1979, expressed this in the following way:

> The objective of nuclear waste management is the effective isolation of the radionuclides from the environment to preserve public health and welfare, and insure adequate safety. It is generally accepted that the first thousand years of the disposal period are the most critical.... The radioactivity and thermal effects from the wastes continue to decay with time. Our ability to predict future geologic events decreases with the time horizon of the prediction; but the hazards of the wastes likewise decrease with time.

The near-term problems of nuclear waste management are different from the long-term problems. In the time frame encompassing the present and the near future, radioactive materials can be safely managed using existing technology and conventional, proven methods. In the long term, however, it is preferable not to rely on human institutions for the continued safe management of radioactive wastes.

In response to this need, DOE is developing and preparing to implement waste isolation systems that will operate independently of human institutions over extended periods of time. Several alternative methods for doing this have been proposed, but a majority of technical experts, among them the President's Interagency Review Group (IRG) on Nuclear Waste Management, believe that of all the possibilities, geologic repositories have the superior combination of characteristics needed for safe, permanent isolation of radioactive wastes from the biosphere.

B. DOE WASTE MANAGEMENT PROGRAM AND TREATMENT OF ENVIRONMENTAL ISSUES

The Waste Management Program is essentially an environmental program. Therefore, program objectives, milestones, assumptions, and strategy are directed at environmental problems. DOE's Waste Management Program addresses environmental problems in each of its three activities: management of defense waste, management of commercial waste, and management of spent fuel. These programs address waste handling, disposal, and isolation to ensure that public health and safety and the environment will be protected. These three activities are described in detail in Chapters II and III.

The three program activity categories are consistent with current budget categories. The management structure often cuts across these categories in order to group similar activities under the same management control. Thus, the management control for environmental issues often transgresses budget categories to ensure consistent and comprehensive treatment.

The Environmental Impact Statement Process

The National Environmental Policy Act (NEPA) requires, among other things, that any Federal agency contemplating any major action "significantly affecting the quality of human environment" must prepare a detailed Environmental Impact Statement (EIS).

The EIS process consists of several steps. First, as soon as the need for an EIS is established, a Notice of Intent is published in the Federal Register; this serves to invite comments by describing the proposed action and its alternatives, and also by describing the proposed scoping process when one is to be carried out. Second, a "draft" EIS is written and published by the agency proposing a major action with reasonable alternatives, and is reviewed by the Environmental Protection Agency (EPA), the Council on Environmental Quality (CEQ), other interested Federal agencies, and the public. The initiating agency then writes a "final" EIS, which incorporates revisions recommended by EPA, CEQ, and others, as well as any substantive comments received. The final EIS is filed with EPA and made available to the general public. Finally, a record of decision is published to formally identify the alternative course of action to be implemented, why it was chosen, and the mitigating measures that will be utilized to avoid or minimize adverse impacts.

DOE is the lead Federal agency for the nonregulatory part of the Nation's Nuclear Waste Management program. It, therefore, assumes responsibility for making sure that the program complies

with NEPA requirements. In this role, DOE must prepare the necessary EIS documents for all major nuclear waste management activities.

A NEPA plan for nuclear waste management is presently under development. Its purpose is to comprehensively describe the Waste Management Program and then to identify the points where the NEPA applies to DOE's decisionmaking activities. The degree of NEPA compliance that will pertain to each of the various levels of decisionmaking will be identified. The plan will present program-specific NEPA compliance responsibilities based on the CEQ Regulations and the DOE NEPA guidelines.

Current Environmental Impact Statement Preparation Activities

Commercial Wastes. A draft generic EIS (DOE/EIS - 0046-D) has been written to cover the alternative technologies for commercial nuclear waste management and their environmental impacts. This statement is a GEIS because it does not apply specifically to any particular project or facility; rather, it is intended to serve as a basis for selecting a comprehensive national strategy for managing commercial nuclear wastes.

The GEIS is focused on high-level wastes (HLW) in the form of discarded spent fuel elements or canisters of waste from the reprocessing of such elements, and transuranic (TRU)-contaminated wastes from all activities including the decommissioning of commercial nuclear facilities. The current Federal plan is to store spent fuel elements retrievably for some as yet unspecified time, pending future decisions concerning reprocessing.

Historically, the GEIS is the successor to a draft EIS (WASH-1539), issued in September 1974 by the Atomic Energy Commission (AEC) on the program for developing temporary and permanent repositories for high-level and TRU wastes. WASH-1539 was withdrawn in April 1975 by the Energy Research and Development Administration (ERDA). The final GEIS will be completed this fiscal year, and will incorporate the public comments received in response to WASH-1539, as well as those received later in response to DOE/EIS-0046-D.

When the Commercial Waste Management Program reaches the point of construction planning for actual facilities, a site-specific EIS may be required which evaluates the technical and environmental issues associated with proposed individual waste management facilities. After the draft and final versions of a site-specific EIS have been submitted to the EPA, the EIS process will have been completed for that facility.

Spent Fuel. Final EIS's will be issued in February 1980 for the storage of domestic spent fuel, the storage of foreign spent fuel, and the dollar charge for spent fuel storage (under one document number). These documents cover the technology and the environmental impacts of temporary away-from-reactor (AFR)

storage of spent fuel elements and the environmental impacts of alternative fee systems that the Government might use to charge for these services.

Defense Wastes. A series of draft EIS's is being prepared to cover the long-term management of defense wastes. These will be site-specific documents, and will deal with detailed plans for the disposal of high-level and TRU wastes at each major defense facility.

Waste Isolation Pilot Plant (WIPP). A draft EIS has been issued and public hearings held to solicit comments and to obtain public participation in the program. WIPP was intended to be the first facility specifically designed for the long-term management of TRU-contaminated wastes. The primary conclusions expected in the final EIS will address the desirability of retrievable waste storage and use of embedded salt as the best medium for isolating TRU from the environment.

Remedial Actions. A series of draft EIS's is being prepared examining the waste management of uranium mill tailings. These EIS's are undertaken for sites which, in the past, were involved in processing ores to extract uranium and which do not currently comply with more stringent Federal radiological exposure guidelines than those enforced in the past. These statements identify the particular sites which require remedial actions, long-term stabilization techniques for uranium mill tailings, methods of transportation, and other issues important to these sites.

The following table lists the nuclear waste management EIS's already published or in preparation.

Table VI-1. Status of EIS Documents

TITLE	SITE	PUBLICATION DATE
COMMERCIAL		
Final GEIS for Management of Commercially Generated Radioactive Waste	N/A	July 1980
AWAY-FROM-REACTOR		
Storage of U.S. Spent Power Reactor Fuel	N/A	February 1980
Storage of Foreign Spent Power Reactor Fuel	N/A	February 1980
Charge for Spent Fuel Storage	N/A	February 1980
Away-From-Reactor Facility Draft EIS	N/A	September 1980
TRU DEFENSE		
Long-Term Management of TRU Wastes	ID	September 1981
Long-Term Management of TRU Wastes	SR	October 1982
Long-Term Management of TRU Wastes	RL	September 1982
Long-Term Management of TRU Wastes	LASL	September 1983
Long-Term Management of TRU Wastes	ORNL	September 1984
HLW DEFENSE		
Long-Term Management of HLW	SR	October 1982
Long-Term Management of HLW	ID	September 1981
Long-Term Management of HLW	RL	September 1982
WIPP	N/A	March 1980
DWPF	SR	June 1981

C. METHODS OF WASTE MANAGEMENT

The foreword to the draft commercial GEIS states the following:

> All waste management systems rely on a multibarrier approach to achieve the required level of isolation. For each disposal concept considered there is a different set of barriers. Each set of barriers starts with the waste form.

The chemical and thermal characteristics of this waste form can be varied in many ways. Variations include aging (cooling) prior to production of the disposal form, dilution of the radionuclides in a matrix material, and partitioning and/or transmutation of certain isotopes. Design of the waste form and adjustment of the disposal canister dimensions provide the next barriers to radioactive material release. The available metals give various degrees of isolation depending on the particular disposal medium and exposure conditions. Absorptive overpack materials, such as zeolites and bentonites, are available as a further barrier. The disposal medium is a massive barrier to the migration of wastes into the biosphere. Choices range from stable, absorptive clays of the seabed; very deep hard rock formations; granite, shale, basalt, salt, and other rock formations; to outer space. The final barrier is the institution(s) which control(s) the disposal system. (The integrity of the institutions determines, in part, the success of the disposal program.) Although no government or society is stable over long periods of time, works of early civilizations still exist today. Therefore, it appears that today's society can construct a repository which would survive. In the near term, institutional controls would provide further assurances of the integrity of the disposal system.

With the variety of design variables available, it is reasonable to project that nuclear waste systems can be designed to ensure that this and future generations will be protected from radioactive wastes.

Federal regulations require that commercial HLW's, if in liquid form, be converted to a solid form within 5 years and that they be shipped to a Federal repository within 10 years after separation from the spent fuel (if reprocessing is to take place). Disposal criteria for high-level and TRU-contaminated wastes are not fully defined, and a disposal facility to receive these wastes and/or spent fuel has not been demonstrated. Various methods are under consideration.

The IRG Subgroup on Alternative Technology Strategies for Isolation of Nuclear Waste found that the technique of disposing of nuclear wastes in mined repositories is promising. The majority of scientists and engineers consulted by this subgroup agreed that successful isolation of radioactive wastes from the biosphere appears feasible for thousands of years provided that the systems view is used vigorously to evaluate the suitability of sites and designs, to minimize the influence of future human activities, and to select a waste form that is compatible with its host rock. A variety of geologic environments and emplacement media could be potential candidates for a repository. Although the engineering aspects of a repository in salt have been studied extensively, no particular environment or medium is currently preferred.

Interim storage facilities for fuel rods or other unreprocessed nuclear material must meet isolation criteria for the period the facilities are to be used. Methods for waste transport are also needed because disposal sites are close to the waste sources.

Final long-term waste disposal must also minimize the possibility of future accidental release of radioactive waste, either through natural forces or man's activities. The interim planning approach by the U.S. Government is emplacement of the wastes in deep continental geologic formations.

Low-level waste (LLW) materials are now disposed of by burial in shallow trenches. There are 6 commercial and 14 DOE burial sites. The total amount of commercial low-level nuclear waste is increasing at about 25 percent per year, primarily from the growth in commercial use of nuclear power reactors*. The provision of disposal capacity is a near-term issue for commercial sites.

*U.S. EPA, Consideration of Environmental Protection Criteria for Radioactive Wastes, February 1978, p. 8.

D. APPLICABLE ENVIRONMENTAL LAWS AND REGULATIONS

The responsibility for establishing and administering environmental standards pertaining to nuclear waste management is divided among several Federal agencies which cooperate in the regulation of the Nation's nuclear waste management effort. The principal agencies involved are DOE, Nuclear Regulatory Commission (NRC), and EPA.

1.0 RADIOLOGICAL STANDARDS

DOE Facilities Standards. Those facilities operated by DOE that are not subject to NRC licensing, such as nuclear weapons facilities, must comply with the radiation standards described in Chapter 0524 of the "Manual of Operations" published by ERDA in April 1975. These standards limit the maximum allowable radiation exposure for individuals, both within the site and in the general population, resulting from facility operations. Any nuclear waste management facilities handling exclusively military wastes would be subject to DOE standards, rather than NRC standards.

NRC Radiation Standards (10 CFR 20). All NRC licensees are required to comply with these basic radiation standards which, except for minor differences, are very similar to DOE standards. Commercial nuclear waste management facilities would undoubtedly operate under NRC licenses, so NRC standards would apply to them.

EPA Uranium Fuel Cycle Standards (40 CFR 190). Emissions of radioactive substances from nuclear power stations and some related fuel cycle facilities are governed by these EPA standards, which supersede NRC standards wherever they overlap. Waste disposal facilities and transportation activities are specifically excluded from these regulations, but they do apply to fuel reprocessing plant operations.

EPA Drinking Water Standards (40 CFR 141). The maximum permissible concentrations of hazardous substances, including radioactive substances, in public drinking water supplies are established by the EPA.

EPA Standards for Uranium Mill Tailings (Inactive Sites). The Uranium Mill Tailings Radiation Control Act of 1978 placed in the EPA the responsibility for establishing radiological and nonradiological environmental standards for uranium milling operations. The portion of the program regarding inactive sites provides the criteria according to which DOE will conduct remedial actions at the sites.

2.0 NONRADIOLOGICAL STANDARDS

In addition to those regulations applying specifically to radiation and radioactive substances, all nuclear waste management facilities will be required to meet environmental standards for nonradiological, or "conventional," pollutants, e.g., dust and sulfur dioxide. It is expected that nuclear waste management facilities will have no difficulty complying with conventional pollutant standards. The principal standards that will apply are listed below.

- Clear Air Act
- Federal Water Pollution Control Act
- Resource Conservation and Recovery Act
- Surface Mining Control and Reclamation Act

3.0 FUTURE REGULATIONS

To enable the Federal Government to regulate a commercial nuclear waste management industry, some additional environmental standards will be needed in the future.

Existing EPA standards for permissible levels of radioactivity in the environment are general, and do not provide specific criteria or guidelines for determining whether a particular facility meets the standards. EPA will begin to issue these more detailed regulations in FY 1981. Some that are under consideration at the present time are: environmental standards for high-level radioactive wastes, environmental criteria for radioactive wastes, classification of airborne radioactive pollutants, guidance on dose rates for TRU elements, and guidance for occupational radiation exposure.

With these EPA criteria and standards in hand, the NRC can proceed to develop regulations for licensing commercial nuclear waste management facilities. These regulations will describe in detail the procedures and technical requirements for designing and constructing full-scale facilities.

E. RESOLVING ENVIRONMENTAL PROBLEMS OR ISSUES

1.0 GENERAL APPROACH

To ensure that the environment is adequately protected, waste disposal analyses and demonstrations must be performed to show that potential waste migration from the disposal sites is acceptable in terms of concentration, probability, and current and future impacts on human health. The main purpose of the waste management program is to develop environmentally acceptable waste management systems. This involves determining the environmental criteria, as well as assessing waste management system performance.

Radioactive effluents from each step of the nuclear fuel cycle are controlled to limit amounts which escape to the biosphere. The issue of the limits that are justified in terms of health impacts versus incurred costs is controversial. The EPA is responsible for setting the applicable standards to protect human health.

Analysis of the fate of the waste materials placed in a disposal medium is also complex. The waste, the encapsulating material, and the geologic structure in which it may be embedded must be studied as they interact with each other. The potentials for chemical and physical transport of the waste material must be carefully analyzed. This is a complex and interactive problem because there are many waste forms (especially from different fuel cycles) and disposal schemes. The NRC licensing process provides a forum for public review and discussion of the safety analyses for sites and disposal techniques.

2.0 KEY ENVIRONMENTAL ISSUES

The following are the key environmental issues facing the Nuclear Waste Management Program, by program element. The status of the program and future plans for resolving these issues are discussed in this document. While specific NEPA actions are not discussed in detail, the program to resolve these issues includes NEPA compliance as a central element of the decisionmaking process.

Defense Wastes

1. On a site-specific basis, for how long are current interim storage methods for TRU and HLW acceptable? What actions should be taken if long-term permanent disposal programs are delayed?

2. On a site-specific basis (due to the various characteristics of wastes at different sites), what is the appropriate processing technique and final waste form to be achieved prior to transport of HLW and TRU to a terminal disposal site? For TRU, buried and stored wastes may be dealt with separately due to the potential of having much greater impacts in recovering the buried wastes.

WIPP

1. Should TRU wastes be disposed of in a geologic repository? Is bedded salt an acceptable medium for isolating TRU from the environment; is retrievability desirable?

2. If the answer to the above question is yes, what are the appropriate sites and timings for such disposal?

Commercial Wastes

1. What commercial high-level nuclear waste disposal alternative should be given the highest priority for development and what alternatives should continue to receive research and development (R&D) resources at a lesser level as fallback options to the most preferable alternative?

2. What site or sites are appropriate for the alternative chosen in the above question and what are the necessary site characteristics for safe disposal of commercial HLW?

3. What is the appropriate timing for site acquisitions and preparation and for operation of the disposal facility?

Remedial Actions

1. What constitutes an imposition on the environment requiring remedial actions? Once remedial actions have been taken, what are the criteria for releasing sites for unrestricted use?

2. What are the criteria for disposing of wastes offsite and for stabilizing wastes in place?

3. What aspects of remedial actions should be subject to licensing?

4. What is the extent of DOE's compassionate responsibility for decontamination of properties not associated with nuclear energy programs?

5. What is the appropriate timing and pace of a program to eliminate the inventory of DOE-owned surplus contaminated facilities to ensure that such facilities do not remain a burden for future generations?

6. What standards and procedures for facility management need to be developed and enforced to avoid the necessity of having a remedial actions program in the future?

Spent Fuel and Transportation

1. Spent Fuel Storage

a. Should Congress enact legislation to authorize and fund the U.S. Government's implementation of the President's Spent Fuel Policy by taking title to and storing some commercial light water reactor (LWR) fuel?

b. Should Congress enact legislation to authorize and fund the U.S. Government's receipt and storage of some foreign spent fuel in order to further nonproliferation goals?

c. If the answer to 1.a. and/or 1.b. is affirmative, what are the expected fuel storage schedules and what facilities (or sites) would be utilized?

d. What methodology would be utilized to determine the storage fee?

e. What are the environmental effects of the above?

2. Transportation

Who shall establish the characteristics of acceptable environmental impacts which underlie transportation regulations for radioactive materials? How can DOE assure technological stability in those choices?

VII. SOCIOECONOMIC ISSUES

The resolution of socioeconomic issues related to nuclear waste management is as essential as the resolution of technical issues and must be addressed by the Nation as a whole. Studies of the following socioeconomic issues are underway to support the development of rules, standards, and guidelines for Federal, State, and local cooperation in nuclear waste management:

- Waste facility siting
- Worker health and safety
- Use of other resources near waste sites
- Local economic impacts
- Assessment of storage costs
- Liability for accidents
- Long-range planning

A working philosophy of consultation and concurrence between the U.S. Department of Energy (DOE) and the States is being developed to ensure a positive mechanism for involving State and local governments in nuclear waste management planning and implementation.

There are some basic assumptions upon which consultation and concurrence are advanced:

- Resolution of the nuclear waste problem requires the efforts of all parties: beneficiary, generator, and recipient. Successful long-term program implementation requires institutional issue resolution.
- States and localities will accept their share of responsibility if they can be assured that all necessary qualifications of the protection of the health, safety, and environment are achieved.
- The politics of cooperation (although sometimes more drawn out in the short term) offer a more realistic long-term solution than the politics of confrontation.

As presently conceived, consultation with a State would mean that DOE provides the State with all information that the DOE itself has about a potential site for a nuclear waste repository; DOE would seek State reaction and advice continually, whether at

the relatively early stage of designing a site investigation program, or at the later stage of deciding to proceed with an application for a Nuclear Regulatory Commission (NRC) license for a particular site. DOE would also attempt to alert the State to information or processes that bear on the future of the site, even if outside the jurisdiction of DOE. In addition to pledging to furnish a State with all information, DOE would also be committed to provide a State with adequate time to react to that information. DOE is also willing to support the cost of a State's hiring a staff necessary to do the review.

Where many view consultation as a process of mutual information and interaction in all issues, concurrence may or may not appropriately be applied on such a basis. Some believe that concurrence should encompass as significantly large and wide range of issues as any given State would need to explore; others believe that concurrence should be focused on the most critical elements and key moments of decisionmaking. Articulate arguments can be advanced for either position. Unless every impasse is resolved through concurrence, provision for some kind of override or appeal process must be seriously considered.

A spirit of cooperation between the Federal Government and the States to fully evaluate socioeconomic issues of nuclear waste disposal is in progress. The Draft Environmental Impact Statement on Management of Commercially Generated Radioactive Waste (DOE/EIS-0046-D, April 1979) projected generic social and economic impacts of a repository and concluded that impacts would be most significant on smaller communities and less so on larger communities since the latter would have previously developed socioeconomic infrastructures. Impacts of a repository upon a rural community will be significant. The influx of workers into the area will place new demands on the public and private sectors. Many facets of life will be affected. The effects include transportation of people and goods, educational services, health provision, public safety, housing, social services, business activity, and others. There will be impact on property values, on gross regional income, and on taxes people pay. While there are regulatory requirements on permissible radiation and health and safety criteria, there may be impacts resulting from public perception of risks to health and safety associated with nuclear waste disposal. Experience in the development of communities with previous nuclear development, such as Richland, Washington, and Los Alamos, New Mexico, provides a base of knowledge and a framework upon which to base the disposal program. There is also a large base of experience from which to draw, resulting from other large-scale public works projects. The DOE, through the Office of Nuclear Waste Isolation (ONWI), has recognized the significance of socioeconomic and institutional considerations, and a socioeconomic program has been established.

DOE research on socioeconomic and institutional issues associated with waste management is a continuing activity. Much of the prior work has been to identify and to develop an understanding of the issues and problems in the socioeconomic realm. Current and anticipated future work in socioeconomic issues places emphasis upon specific impacts at specific sites. Such work will proceed parallel with technical studies in site selection, and with site-specific environmental impact studies. As the specific impacts become better understood, there will be efforts to develop impact mitigation strategies and policy studies to assist DOE and Congress on selection of such strategies.

As the nuclear repository site selection process proceeds to candidate sites, there will be increasing interaction with local officials, concerned groups, and the general public. Formal proceedings, such as public hearings to obtain a variety of views, will be held. Also, there is expected to be involvement of local officials and the public in determining site-specific socioeconomic impacts and in developing mitigation strategies. The following issues are among the most important for which public participation is essential.

Waste Facility Siting

There is sincere concern over having nuclear material stored or disposed of near one's home. A nuclear waste facility is often viewed as a community detriment, much as prisons or sewage treatment plants are perceived. The public must be convinced that the disposal method is safe, that the local communities will not be exposed to radiation or threatened with nuclear contamination, and that property values will not be significantly depressed by a waste facility. Communities located close to the repository may feel that they are bearing a disproportionate share of a national burden. They may not realize the benefits of nuclear power to their community, but they will realize that vast amounts of nuclear wastes are located nearby.

Public participation in deciding where to locate and how to operate repositories will be necessary. Cooperation between the Federal, State, and local governments must be supplemented by contact with community groups, such as State Planning Councils and other forums encouraged by DOE.

Worker Health and Safety

The incidence of accidents and injuries in Federal nuclear operations is very low compared to most other areas of industrial-scale activity. Radiation exposures are maintained at low levels and workers are monitored to ensure that regulations are observed. DOE will continue to comply with all occupational health and safety rules. Nevertheless, accidents do occur. DOE

health and safety programs will be maintained and expanded as necessary to assure continued improvement in the protection afforded workers.

Use of Other Resources Near Waste Sites

Some land will be permanently committed to the management of nuclear waste. In geologic repositories, the radioactive life of the stored material will limit the use of the storage area for long periods. The land surface is expected to become usable for other purposes after the repository is sealed. Recovery of underground resources near the repository site will be restricted for long periods to keep the repository intact.

Local Economic Impacts

Repositories are likely to be placed in remote areas. The local community can benefit economically from having a waste storage site nearby. The local economy realizes additional revenues during construction and operation of a repository. Local workers may find jobs, and merchants will also benefit.

Both construction and operation will bring new people and money into the community. Provision of additional local governmental services may require increased Government investment. Local governments may not be in a position to respond in a timely fashion to these needs. In some people's view, the community could become a less attractive place to live due to increased traffic and noise. The repository itself may be considered as a detriment to the area.

Assessment of Storage Costs

Determination of the proper fees (or charges) to a utility for spent fuel storage and disposal is affected by several issues. Because the facilities for storage of spent fuel have not been determined, the storage system costs are not completely established. Disposal charges would have to include provisions to cover the future costs of the storage repository.

Liability for Accidents

Liability insurance for the nuclear industry is largely governed by the Price-Anderson Act. Through a system of private insurance and Government indemnity, the Price-Anderson Act is designed to assure that the public is protected in the event of a nuclear accident connected with a facility operated under a contract with a license issued by the Government. Such an accident is considered extremely unlikely. However, Congress wanted to ensure that insurance against loss or damage should not be limited to that which could be expected by private insurance.

Under the Price-Anderson Act, the DOE and NRC are authorized to enter into indemnity agreements with contractors and licensees operating nuclear facilities. Through these indemnity agreements, financial protection is currently afforded up to a limit of $560 million per accident. If damages should exceed that amount, Congress has provided in the Price-Anderson Act that it will "thoroughly review the particular incident and will take whatever action is deemed necessary and appropriate to protect the public from the consequences of a disaster of such magnitude."* Thus, even the $560 million limit is not absolute.

Indemnity agreements cover not only accidents occurring at the site of the contractual or licensed activity, but also accidents which might occur in the transportation of material to and from the site.

Long-Range Planning

Planning for nuclear waste management involves much long-range forecasting and estimating. The technical design of a nuclear waste repository and the plan to manage and maintain it must extend at least for the next 100 years, under currently proposed Environmental Protection Agency (EPA) guidelines. Thus, the analysis of potential risks of the facility and how they will be mitigated to acceptable levels involves considerable future forecasting.

Each potential risk mechanism will have to be separately examined, and suitable safeguards devised. The cost of these safeguards, now and in the future, will have to be estimated. Institutional arrangements to protect the waste repositories from natural phenomena and accidental or deliberate intrusion will have to be designed. Since most engineering structures are designed for much shorter lives--30 to 50 years--design of the nuclear repository presents unusual and difficult planning requirements.

Studies concerning these socioeconomic issues are being performed by the DOE Nuclear Waste Management Program. Particular State sensitivities to the issues are recognized in an open and honest environment. Significant progress is being made to resolve problems in States which have organized planning and research committees (New Mexico, Utah, Texas, Mississippi, Louisiana, Nevada, and Washington) to interact with Federal agencies involved in waste management and storage.

*42 U.S.C., Section 2210e.

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VIII. SMALL AND DISADVANTAGED BUSINESS UTILIZATION

U.S. Government procurement policy strives to include small and disadvantaged businesses (S/DB's) to the maximum extent possible. This policy has been consistently reaffirmed by several acts of Congress and has been implemented by special Federal support organizations and through the Federal Procurement Regulations, which set the guidelines for many of the Government's acquisitions. The U.S. Department of Energy (DOE) continues to affirm the participation of S/DB's in national energy programs.

A. CURRENT U.S. PROCUREMENT POLICIES AND PRACTICES

As described in the following sections, the procurement of goods and services by the Federal Government is conducted under laws and regulations which are undergoing changes concerning the participation of small businesses, disadvantaged businesses, and concerns in labor surplus areas.

1.0 U.S. PROCUREMENT REGULATION REFORM

Congress passed the Office of Federal Procurement Policy Act (Public Law 93-400) to improve the efficiency and competitiveness of procurement by U.S. departments and agencies. The Office of Federal Procurement Policy (OFPP) was established in the Office of Management and Budget (OMB/OFPP), and is replacing the Federal Procurement Regulations with a unified Federal Acquisition Regulation. The new regulation will reduce the proliferation of regulations, eliminate conflict and redundancies, and be simple and understandable. The regulation is being made available in segments for Government agency and public review. Parts 19 and 20 of the regulation cover small and minority businesses as well as labor surplus area set-asides which presently appear under other regulatory chapters and headings. Although this procurement regulation reform does not alter U.S. policy toward S/DB's, it should become significantly easier for such businesses to understand and participate in the Federal procurement system.

2.0 NEW LEGISLATION

The Small Business Act of 1958 and its subsequent amendments provide special attention for small and disadvantaged business enterprises in Federal procurement activities. Under these laws, the civilian Federal agencies prepare an annual report on their use of minority business for submission to Congress by the U.S. Department of Commerce/Office of Minority Business Enterprises. The Small Business Administration (SBA) is responsible for reporting to Congress on small business utilization in Federal agencies each year and for administration of programs to assist small businesses. SBA also administers the "8A Program," which identifies disadvantaged (minority) businesses and contracts with them as the purchasing agent for other Federal agencies.

On October 12, 1978, Congress passed the 1978 Small Business Administration Amending Act (Public Law 95-507), an important new legislative initiative concerning procurements in labor surplus areas from S/DB enterprises. The regulations and procedures implementing this law for all Federal departments and agencies are presently being developed.

One key provision of the Amending Act substitutes the words "socially and economically disadvantaged business concern(s)" for "minority" businesses. This is expected to broaden substantially the number and kinds of businesses eligible for special assistance under the Act. The Amending Act also requires submission of a specific subcontracting plan by Federal contract offerors which provides the maximum practicable opportunity for S/DB's to participate in contract performance. Each Federal agency with procurement powers is required to establish an Office of Small and Disadvantaged Business Utilization. This office will be headed by a director responsible to the agency head or deputy. Procurement "set-aside" procedures established for small business participation in research and development (R&D) and architectural/engineering (A/E) contracts are also required by this Act. Finally, the Act abolishes several Executive Orders concerning S/DB's over the past several years.

B. DOE RESPONSIBILITIES AND ACTIVITIES

One of the stated purposes of the DOE Organization Act (Public Law 95-91) was the "continued good health of the Nation's small business firms ... involved in energy production, transportation, research, development, demonstration, marketing, and merchandising." Furthermore, all DOE procurement offices and activities are subject to the provisions of law and the Federal Procurement Regulations concerning procedures for encouraging participation by small businesses, disadvantaged businesses, and concerns located in labor surplus areas.

Many DOE procurements are handled by its Office of Procurement and Contracts Management, which reports directly to the Office of the Secretary. Some procurements are handled through several major buying offices in the field or by several major contractors to whom DOE has delegated procurement authority. Under the requirements of the SBA Amending Act, DOE has established an Office of Small and Disadvantaged Business Utilization which has a director responsible through the Director, Procurement and Contracts Management to the Chief Financial Officer. It is the policy of this office to strive for placing a fair proportion of its total procurements for research and technology development and demonstration, support services, supplies, maintenance, repairs, and construction with small business concerns in general and in particular with those concerns which can be identified as socially or economically disadvantaged.

To ensure the success of this policy, the following five-point program framework has been established to serve as a guideline for policy initiation and management:

- Creation of a Nuclear Energy (NE) S/DB Development Task Force
- Establishment of formal NE procurement goals and objectives for S/DB concerns and labor surplus set-aside areas
- Designation of S/DB facilitators in each of the three major program offices of NE
- Development of a comprehensive source list of S/DB concerns and labor surplus areas within each program directorate
- Development of a public information program to increase S/DB participation in NE procurements

The Office of the DOE Assistant Secretary for Nuclear Energy (ASNE) is responsible for conducting research, development, and subcommercial-scale demonstrations of new energy technologies. This unit supervises the work of two major program offices: Nuclear Fission and Nuclear Energy Waste Management (NE). DOE has also identified specific labor surplus/small business/ disadvantaged business contacts for each Headquarters program office, each DOE major buying office in the field, and several major contractors with delegated procurement responsibilities.

As a regular and continuing part of the NE research, development, and demonstration (RD&D) programs, DOE and NE procedures include a system of Program Opportunity Notices (PON's) and Program Research and Development Announcements (PRDA's) which are issued to encourage widespread interest, involvement, and participation in NE technology and research programs.

1.0 DOE/OFFICE OF NUCLEAR ENERGY PROCUREMENT RECORD

The creation of DOE on October 1, 1977, combined the functions, responsibilities, and staffs of a number of predecessor agencies. Because of this reorganization, it is difficult to state briefly the past performance of DOE in encouraging small business, minority business, and labor surplus area participation in DOE programs and procurement activities. Table VIII-1 lists the procurement dollars spent.

Table VIII-1. Total DOE Procurements in Small and Disadvantaged Businesses

YEAR	TOTAL DOE PROCUREMENTS (IN THOUSANDS OF DOLLARS)	SMALL BUSINESS (IN THOUSANDS OF DOLLARS)	DISADVANTAGED BUSINESS (IN THOUSANDS OF DOLLARS)
FY 1976	4,183,707	520,208	13,900
FY 1977	6,825,000	705,000	32,308
FY 1978	7,521,502	1,054,615	84,360
FY 1979*	6,455,207	930,620	**
FY 1980***	7,400,000	1,491,000	156,000

*Preliminary
**Not Available Yet
***Estimate

In August 1978, DOE published and distributed a document entitled "Introduction to DOE Procurement" (DOE/PR-00113). This document describes the procedures required to participate in the DOE procurement process and identifies specific labor surplus area/small and disadvantaged business contact points and

officials for 22 major DOE buying offices and for 42 major DOE contractors. DOE has assigned labor surplus area and S/DB procurement awards and set-aside funds to its Headquarters, program, and field offices.

With joint funding by DOE and the Small Business Administration, the Procurement Automated Source System (PASS) was developed and introduced during October 1978. The system listed small and minority business concerns in four categories: research and development (R&D), construction, manufacturing, and services. A separate DOE-funded effort identified 600 to 700 high-technology S/DB firms from May to July 1977. This list has been provided to all major NE programs and executing offices.

Also, NE was one of the first Federal organizations to test a "Mandatory Subcontracting to Small Business" clause in primary contract awards as part of an OMB/OFPP program.

2.0 CURRENT ACTIVITIES OF THE OFFICE OF NUCLEAR WASTE MANAGEMENT

The DOE Waste Management Program is decentralized to field operations offices. Major efforts are underway at these operations offices to utilize S/DB enterprises. A computerized system to help increase the number of contracts awarded to such enterprises has been installed. Terminals are located at Headquarters and several operations offices and contractors' offices. This system, called Procurement Automated Source System (PASS), will permit DOE and its contractors access to small, disadvantaged, and women-owned firms. Approximately 17,000 firms are already in the PASS data base. In addition, each operations office is designating an S/DB specialist to serve as a central contact point for this program.

The Richland (RL) Operations Office has established a vigorous program designed to increase the utilization of S/DB's. Each fiscal year RL's Government-owned Contractor-operated (GOCO) contractors receive a percentage goal for placing both small and disadvantaged business contracts. These percentages are established such that each contractor must continue to make a conscientious effort to increase contract awards to S/DB's. The contractor's performance in obtaining these goals is monitored monthly. The goals are part of an annual subcontracting plan each GOCO is required to submit for approval prior to the beginning of the fiscal year. Rockwell Hanford Operations (RHO), the contractor responsible for most waste management programs at RL, is under an award fee contract. As such, RHO has an added incentive to achieve or exceed these established goals as its performance in this area is factored into each award fee evaluation report. RL and its operating contractors actively participate in various activities and organizations that help locate more small and disadvantaged firms in order to increase contracts to these companies.

The Nevada Operations Office is endeavoring to place the appropriate contractual clauses in all the contracts and subcontracts placed with organizations who support nuclear waste management projects. Consistent with the requirements of these clauses they are now receiving FY 1980 Subcontracting Plans from DOE/Nevada Operations Office contractors. These plans include: (1) annual goals expressed in terms of the percentage of prime contract amount which will be awarded to S/DB concerns, (2) designation of individuals who will supervise the contractor organization's compliance, (3) procedures associated with procurements exceeding $10,000 which document the actions taken to procure from S/DB, and (4) a commitment to provide equitable opportunities allowing S/DB's to compete for procurements. These subcontracting plans are reviewed and evaluated to assure that contractors are planning efforts which will result in the increased award of contracts to S/DB as compared to prior year records.

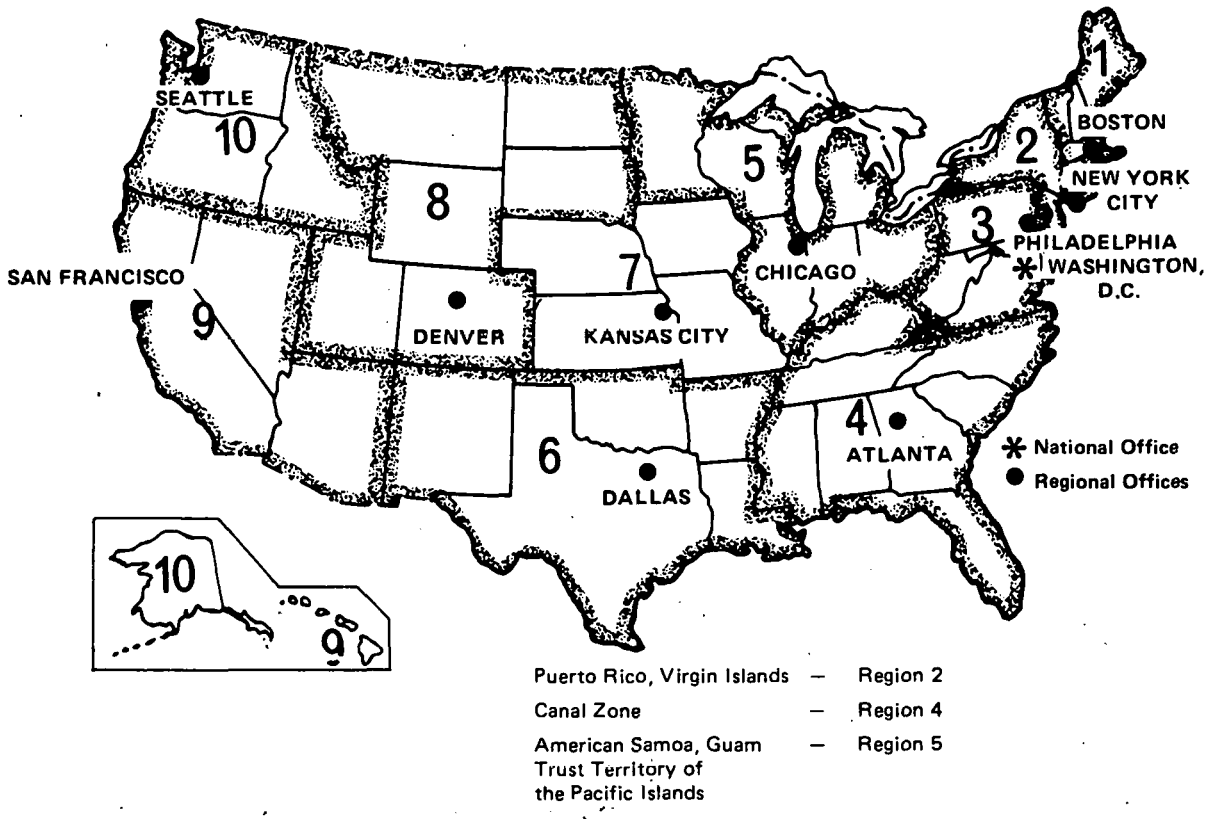
At the Savannah River Plant (SR) the operating contractor, E. I. Du Pont de Nemours and Company, has developed a progressive program to increase the utilization of S/DB. Overall goals are established for this program and these goals are broken down into goals for each buyer. To help reach the overall goals, Du Pont has developed a very successful program to identify and make award to S/DB's that have never done business with Du Pont before. Du Pont averages over 400 awards to new firms per quarter as a result of this program. Du Pont has set aside 157 commodities and services for exclusive award to small business.

The Albuquerque Operations Office (AL) has very beneficial Small Business (SB), Disadvantaged Business (DB), Women Business Enterprise (WBE), and Labor Surplus Area (LSA) Programs, and is constantly looking for ways to improve their past performances in these programs. Efforts have been and will continue to be increased in the above areas by:

- Assigning two individuals, on a part-time basis, to act as SB Technical Advisors to the local SBA Procurement Center Representative as required by Public Law 95-507
- Establishing formalized guidance which provides methods to establish, develop, and monitor SB/DB/WBE/LSA programs at all appropriate DOE/AL prime and subcontracting levels
- Including these programs as central elements to be reviewed during all Contractor Procurement System Reviews (CPSR's) and subsequent CPSR Surveillance Reviews by independent joint DOE/SBA Small Business Subcontracting Review Teams
- Establishing AL and GOCO procurement goals for FY 1980 in each of the socioeconomic programs

IX. REGIONAL ACTIVITIES

Administrative and research activities for the Nuclear Waste Management Program are dispersed throughout the country. This decentralization of U.S. Department of Energy (DOE) programs is supported by 10 regional representatives who represent the Secretary of DOE and who provide a mechanism to interface with States, localities, and the public. The regional offices provide information to the general public and collect information relevant to public opinion on DOE policy, programs, and implementation.



DOE Regions

Regional activities differ from field activities (discussed in Chapter IV) in that the latter represent the program support offered by DOE contracted personnel and DOE personnel. Regional activities, however, represent DOE's direct efforts to interface with local, State, and regional governments, as well as various consumer groups, trade associations, and other sectors of the public.

This program will seek more State and local government participation in the responsibilities of decisionmaking regarding the Waste Management Program. There is a clear recognition between DOE and State governments that strong differences exist regarding waste repository issues. With a mutual process of exploration of these issues as a start, conflicts can be explored carefully and openly, technical or other solutions developed, and final decisions made rationally. Regional representatives of the DOE Waste Management Program are in a position to offer this level of dialogue on a continual and local basis.

One approach now in use to encourage mutual participation is through direct involvement in various projects. This involves States in the planning process to the earliest extent possible so that their interests are designed into programs as well as their right to share in the implementation of programs. A cooperative relationship like this between State and DOE representatives ensures effective State participation and improves the degree of program acceptance both socially and technically through an open exchange of information.

Regional DOE representatives are also involved in liaison between the Federal Government and State Planning Councils, which consist of an acting body of Governors, representatives of State legislatures, and other interested State parties. This forum also provides a range of opportunities for participation by various public groups in national waste management decisions.

X. INTERNATIONAL PROGRAMS

The development and demonstration of nuclear waste management technology is a high-priority objective of every nation utilizing atomic energy. Some countries are delaying commercial operation of new reactors until their scientific community assures the safe disposal of nuclear wastes. Others are enforcing less stringent requirements but with equal fervor to make near-term progress in waste isolation. The Nuclear Energy Waste (NEW) program is actively involved in increased international cooperation among the many nations and several international organizations sponsoring research, development, and demonstration (RD&D) programs in this field.

Cooperative international activities serve key U.S. foreign policy objectives and advance the domestic energy program. It is important that U.S. Government officials and their representatives participate in waste management exchanges to:

- Minimize waste management research and development (R&D) expenditures of participating nations by eliminating duplications of test facilities and experimental programs
- Help establish an internationally accepted technological basis for waste conditioning processes and waste disposal criteria and methods
- Contribute to the base for systems evaluations
- Improve plans for U.S. RD&D programs

Cooperation between the United States and other nations in radioactive waste management may be bilateral or multilateral, and the cooperative activities may range from information exchanges to cooperative technical projects.

A. INTERNATIONAL WASTE MANAGEMENT ACTIVITIES

There are many foreign waste management R&D activities which complement or duplicate similar work in the United States. These activities of equivalent technical sophistication reinforce some U.S. program conclusions while redirecting others. This section summarizes major cooperative foreign activities and indicates those areas where information exchange and/or mutual development of technology is occurring or felt to be of potential value to the United States. Table X-1 shows the major countries involved in waste management R&D and their participation in international waste handling and isolation activities.

All research of geologic waste isolation is of interest to the NEW defense and commercial programs. Topics that have been studied from a different perspective than that of U.S. scientists which are of particular interest are isotopic pathway analysis, hydrologic modeling, rock properties, heat transfer, and design criteria related to granite, shale, salt, and basalt. Data concerning isotope migration through clay formations have been extensively studied by other countries and are also useful to U.S. programs. A listing of the countries involved in geologic waste isolation and their current areas of research and milestones are shown in Table X-2.

While the U.S. commercial activity does not involve reprocessing, fuel reprocessing plants are the source of large quantities of defense high-level waste (HLW). Hence, a significant part of the DOE defense waste activity is directed to the selection and characterization of acceptable waste forms and the development and demonstration of production-scale waste immobilization processes. The major waste conditioning activities performed by foreign countries and agencies are presented in Table X-3. Advanced HLW vitrification programs exist in the Federal Republic of Germany, France, Belgium (Eurochemic), the United Kingdom, India, and Russia. The physics and chemistry of glasses and other waste forms under long-term geologic exposure are also being studied by countries under international cooperative agreements.

The U.S. program on airborne wastes would benefit from cooperative development of separation and immobilization methods for tritium, krypton, iodine, and carbon-14 since complete technology packages (or systems) do not exist for all of these purposes. The treatment of off-gas from HLW solidification processes, to control discharge of ruthenium and other volatile materials or particulates, is under investigation at all sites developing solidification processes. The United Kingdom and

Table X-1. Waste Handling and Isolation Activities in Countries with Major R&D Programs

	TRANS-PORTATION	INTERIM STORAGE	SHALLOW LAND BURIAL	GEOLOGIC ISOLATION	SEABED ISOLATION	AIRBORNE WASTE IMMOBILIZATION	SAFETY/ RISK ANALYSIS
Austria				X			X
Belgium	X			XX		X[a]	X
Canada		XX		XX		X	X
Denmark				X			
France	XX	X	X	XX	XX	X	XX
Federal Republic of Germany	XX			XX		XX	XX
India				X			X
Ispra							XX[b]
Italy				X			
Japan	XX			X	XX	X	X
Netherlands				X			X
Spain		X		X			
Sweden		XX		XX			XX
United Kingdom	X	X		X	XX	XX	XX
USSR	X	X	X	X			

a) Eurochemic/NEA program — Mol, Belgium

b) Joint Research Centre of CEC — Ispra, Italy

X) R&D activities underway.

XX) U.S. interest in cooperative program is already identified.

Table X-2. Geologic Waste Isolation Research Activities in Foreign Countries

NATION	WASTE TYPE	FORMATIONS OF INTEREST	CURRENT STUDIES	MILESTONES
Austria	Spent fuels Miscellaneous wastes	Hard rock	Site evaluation Granite properties Safety assessment	
Belgium	HLW Non-HLW	Clay beds	Site evaluation Clay-bed properties In situ studies – tunnel	Pilot repository at Mol for alpha and non-HLW – 1982
Canada	Spent fuels HLW Non-HLW	Bedded salt Plutonic rocks	Site evaluation In situ studies – Granite test site Plutonic rocks Exploratory drilling Safety assessment Repository design	Commercial repository: Site selection – 1982 Demonstration – 1990 Startup – 2000
Denmark	Miscellaneous	Salt	Site characterization including deep drilling Repository feasibility studies Safety assessment	
France	Alpha wastes	Rock salt Crystalline rocks	Geologic survey Safety assessment Okla Phenomenon Repository design Site characterization	Pilot plant repository (alpha wastes) – 1985
Germany (East)	Non-HLLW	Salt	Repository development at Bartensleben	
Germany (West)	Spent HTGR fuel Non-HLLW	Salt	Salt mine operation – Asse mine Safety assessment Engineering for spent fuel and HLW In situ tests at Asse (salt)	Commercial repository at Gorleben – late 1980's
	Non-TRU LLW and ILW	Hard Rock	Repository design and development (rock)	
India	HLW Non-HLW	Igneous rock Sediments	Site evaluation Properties of rocks	
Ireland	Non-HLW		Geologic survey	
Italy	HLW	Clay Salt	Geologic survey In situ studies in clay beds Site characterization Salt assessment	Pilot plant repository – mid 1980's
Japan	HLW	Varied rock	Geologic survey Safety assessment	
NEA	HLW	Seabed	Seabed Working Group	
Netherlands	Non-HLW	Salt	Geologic survey Safety assessment Site characterization Repository design	
Spain	HLW Non-HLW	Shale Clay Salt	Non-HLW going into old uranium mines Site evaluation	Pilot plant repository – late 1980's
Sweden	Spent fuels HLW Non-HLW	Hard rock (granite)	Field tests - Stripa mine Safety assessment In situ migration tests (Studsvik) Repository design studies	Pilot plant repository – mid-1980's
Switzerland	HLW Non-HLW	Granite	Site evaluation Safety assessment Development for test site for HLW	
United Kingdom		Clay Crystalline rock	Geologic survey Safety assessment Site evaluation	Commercial repository – 2000
USSR	Non-HLW	Varied	Direct injection underground	
CEC	HLW		Support work in Belgium and Italy (clay), Federal Republic of Germany and Holland (salt), United Kingdom and France (crystalline rock)	

Table X-3. Waste Conditioning Activities in Countries and Agencies with Major R&D Programs

	HLW CONDITIONING	HLW FORM CHARACTERIZATION	SPENT FUEL PACKAGING	LLW AND INTERMEDIATE LEVEL WASTE CONDITIONING	TRU WASTE CONDITIONING
Australia	XX	XX			
Belgium & Eurochemic	X[a]	XX[a]		XX[a,b]	XX[a,b]
Canada	X	XX	XX	X	
France	X	XX		X	X
Federal Republic of Germany	XX	XX		XX	XX
India	X			X	X
Ispra		XX[c]			X[c]
Italy	X			X	
Japan	X	X		X	X
U33R	X	X		X	
Sweden	X	X	XX	X	
United Kingdom	X	XX	X	X	XX

a) *Eurochemic/NEA Program—Mol, Belgium.*
b) CEN/SCK program.
c) Joint Research Centre of CEC — Ispra, Italy.

X) *R&D activities underway.*
XX) U.S. interest in cooperative is already identified.

Germany are studying krypton implantation in metal matrices; these two countries and France are also making significant progress in developing methods to immobilize tritium. There is universal interest in programs concerned with the monitoring, conditioning, and disposition of tritium-contaminated effluents and wastes.

NEW has some interest in the European monitoring methods for burial of low-level waste (LLW). Generally, however, European programs are less extensive because sea dumping and mine disposal methods are now in use there.

The transuranic (TRU)-contaminated waste incineration technology in the United Kingdom and Belgium is significant for U.S. programs. A British incinerator concept has been used as a design basis for some NEW work. The Belgium slagging pyrolysis incinerator concept is the design basis for another NEW program. Wet combustion techniques for combustible wastes are under study in Germany, Japan, Belgium (Eurochemic), and the United Kingdom. Moreover, the United States is exchanging acid digestion technology with Germany and the United Kingdom. The Eurochemic effort is a German design effort.

The transportation programs of Canada, Japan, the United Kingdom, Sweden, France, and the Federal Republic of Germany are developing technology for package design, isolation, testing, and risk assessment which are of value to the United States. In addition, efforts are underway to establish uniform transportation safety standards to permit safe movement of nuclear materials throughout the world. Development of the basic standards and model regulations are a basic function of the International Atomic Energy Agency (IAEA).

It is probable that use of the seabed for waste disposal can become a reality only with international support. It is encouraging to recognize that international cooperation in seabed disposal is flourishing, with participation from Canada, France, Japan, the United Kingdom, the United States, and The Netherlands under the auspices of the Seabed Working Group of the Nuclear Energy Agency (NEA) of the Organization for Economic Cooperation and Development (OECD).

B. BILATERAL AGREEMENTS

As shown in Table X-4, the United States has four bilateral agreements and an additional four pending which relate to nuclear waste management.

Table X-4. Bilateral Agreements

COUNTRY	DATE CONCLUDED	PRINCIPAL SUBJECT
Sweden	July 1, 1977	Radioactive Waste Storage Stripa Mine Tests
Canada	September 8, 1976 (expires September 1980)	Radioactive Waste Management and Systems Analysis of Heavy Water Reactors
Federal Republic of Germany	December 20, 1974 (expires December 1979, extension pending)	Radioactive Waste Management
United Kingdom	September 20, 1976	Fast Breeder Reactors (FBR's)*
Belgium	Pending	Radioactive Waste Management
Japan	January 31, 1979	FBR's*
Australia	Agreement Pending	HLW Immobilization, Mine/Mill Tailings Nuclide Migration
European Community	Agreement Pending	Waste Management

*Note: These agreements on FBR's include an annex covering cooperation in nuclear waste management

The agreement with Sweden is for a specific, limited scope cooperative program at their Stripa mine. Activities include field tests and the advancement of techniques used in measuring the movement of fluids through fractures in a granite rock system. The results of these tests will provide useful data for evaluating U.S. granite as a terminal storage repository and will also provide techniques for measuring fluid movement through U.S. formations.

Other bilateral agreements provide for the mutual exchange of technical and scientific data, information, and personnel as well as collaboration on joint projects. (Information on fuel reprocessing or waste management processes that require reprocessing or plutonium recycle for implementation has been withheld by the United States due to the U.S. policy on nuclear nonproliferation.) The agreements cover waste management aspects of the entire fuel cycle, specifically, HLW solidification and

packaging, treatment and packaging of intermediate-level wastes and LLW, treatment of TRU waste, trapping and storage of gases, evaluation of alternative disposal concepts, decommissioning of nuclear facilities, operating experience with LLW, transportation of wastes, and retrievable surface storage.

The bilateral agreements with Canada, the Federal Republic of Germany, and the United Kingdom, as well as those pending with Belgium and Japan, are similar. The only agreements to participate in joint projects to date have been with the Federal Republic of Germany and Sweden for work on geologic disposal. Information exchange under these agreements has been extensive. The Federal Republic of Germany has made use of visitation privileges at U.S. laboratories and contractors; U.S. visits to Federal Republic of Germany facilities have been productive and well received, although less extensive. The United States-Sweden program has been a fruitful program that involves joint tests, in place, of the thermal and hydrological characteristics of the granite at the Stripa Mine in Sweden. An active exchange program is also taking place under the agreement with the United Kingdom for technologies concerned with TRU-contaminated LLW's. The pending bilateral agreements with Australia and the European Community are new initiatives with additional promise for the NEW program.

The United States and Brazil are starting a university-to-university collaborative research program in support of waste management. The U.S. DOE interest is through New York University and the Brazil/CNEN interest is through their Federal University and Catholic University. The planned work is to study the behavior of a natural deposit of heavy elements and to observe what impacts this deposit may have had on the surrounding environment.

C. MULTILATERAL AGREEMENTS

Multilateral cooperation in radioactive waste management takes place under the auspices of several international organizations of which the United States is a member or an observer. The United States participates in advisory groups, working groups, joint meetings, and ad hoc projects through the multilateral agreements.

1.0 ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT/NUCLEAR ENERGY AGENCY

The NEA is the official nuclear power implementation organization of the OECD. A Steering Committee for Nuclear Energy guides the activities of several coordinating committees--one of which, the Radioactive Waste Management Committee, together with its several subordinate working groups, is devoted to radioactive waste management.

The Working Group on Geologic Disposal meets annually to develop methods for increasing cooperation and to exchange information on the status of national RD&D programs. A key objective of this subgroup is to expand the areas of cooperation between the countries involved. As an outgrowth of this working group activity, a Stripa Project Joint Technical Committee has been formed by the NEA concerned with experiments at the Stripa Mine to assess the concept of radioactive waste storage in mined caverns in granite. The first experiments are anticipated to start by July 1980.

The NEA Seabed Working Group of the Radioactive Waste Management Committee meets annually with the objective to provide a forum for discussion, assessment of progress, and planning future efforts in international cooperation on seabed disposal; to coordinate joint research cruises and experiments; to identify unique test facilities; to exchange information; and to maintain cognizance of international policy issues.

The regular meetings of the Radioactive Waste Management Committee and its working groups have provided a useful catalyst for bilateral activities. Also, there has been considerable discussion of NEA sponsorship for multinational waste projects, although no projects have been established to date.

Member States in NEA are:

Australia	Iceland	Portugal
Austria	Ireland	Spain
Belgium	Italy	Sweden
Canada	Japan	Switzerland
Denmark	Luxembourg	Turkey
Finland	The Netherlands	United Kingdom
France	New Zealand*	United States
Federal Republic of Germany	Norway	Yugoslavia*
Greece		

*Special Status

2.0 COMMISSION OF THE EUROPEAN COMMUNITIES

The Commission of the European Communities (CEC) has established a comprehensive program of radioactive waste management technology development to be conducted in various laboratories throughout the European Economic Community (EEC). It parallels the U.S. program and supports a variety of waste conditioning and disposal programs, including surveys of the suitability of disposal in various types of geologic formations. Discussions of a possible bilateral agreement with the United States are in progress.

Current work on geologic disposal includes the use of salt formations in the Federal Republic of Germany and The Netherlands, argillaceous formations in Belgium and Italy, and crystalline rock in France and the United Kingdom. The CEC funds and operates joint research centers at Ispra, Italy; Karlsruhe, the Federal Republic of Germany; Petten, the Netherlands; and Geel, Belgium.

3.0 INTERNATIONAL NUCLEAR FUEL CYCLE EVALUATION PROGRAM

At an October 1977 organizing conference, over 50 nations and 4 international organizations agreed to join the United States in a comprehensive international evaluation of the nuclear fuel cycle. This program is a Presidential initiative which has the active involvement of NEW in two of the working groups. Working Group 6 focuses on nuclear fuel storage; Working Group 7 focuses on nuclear waste management. It is expected that the International Nuclear Fuel Cycle Evaluation (INFCE) Program will be completed in 1980.

4.0 INTERNATIONAL ATOMIC ENERGY AGENCY

The IAEA, an autonomous member of the United Nations, is devoted to the peaceful uses of atomic energy. It is actively involved in many aspects of nuclear power development, from information exchange and the sponsoring of symposia to the establishment of safety criteria for power reactors, associated fuel cycles, and supporting services for operations R&D programs,

to the application of an international safeguard system for signatory nations of the Treaty on the Non-Proliferation of Nuclear Weapons, and to direct technical assistance provided to developing nations.

The IAEA has published reports, sponsored scientific meetings, and prepared codes of practice on radioactive waste management. Technical guidance is offered to member countries on procedures for establishing limits for release of radioactive material into the environment and monitoring actual releases from nuclear facilities.

An example activity of particular interest to NEW is the Advisory Group on Radioactive Waste Disposal into Geological Formations, which was formed in 1978. The Advisory Group plans to develop guidelines over the next several years for safe underground disposal. The guidelines will address the entire range of currently conceivable options.

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APPENDIX A

February 12, 1980

THE WHITE HOUSE

FACT SHEET

THE PRESIDENT'S PROGRAM ON RADIOACTIVE WASTE MANAGEMENT

HIGHLIGHTS

In a Message sent to Congress today, the President outlined a comprehensive national radioactive waste management program. This program is based on the report of the Interagency Review Group on Nuclear Waste Management published in March, 1979.

The paramount objective in managing nuclear wastes is to protect the health and safety of all Americans, both now and in the future. The disposal of nuclear waste should not and will not be deferred to future generations.

The key elements of the President's program are:

- All levels of government share the responsibility for safe management and disposal of nuclear wastes.

  - In order to provide a more effective role for State and local governments the President has created a State Planning Council of elected State, local, and tribal officials and heads of cabinet departments and other federal agencies. Governor Richard Riley of South Carolina will serve as Chairman. State Representative Paul Hess of Kansas will serve as Vice Chairman. The Council will advise the Executive Branch and will work with Congress on key radioactive waste management and disposal issues, especially related institutional decisions.

  - The basis of the relationship between States and the Federal government in the siting of high level waste repositories will be the principle of consultation and concurrence.

- Pending reviews required by the national Environmental Policy Act, an interim planning strategy for disposal of high level and transuranic waste has been adopted that relies on mined geologic repositories.

  - The program directed toward siting and opening repositories will be technically conservative, include expanded and technically diversified research and development and site investigations, and move carefully, in a step by step manner, toward site selection and operation of the first high level waste repository.

- Immediate attention will focus on locating and characterizing a number of potential repository sites in a variety of different geologic environments with diverse rock types. This effort will be supported by a comprehensive research and development program. When four to five sites have been evaluated and found potentially suitable for a repository, one or more will be selected for further development as a licensed, full-scale repository. The site for the first full-scale repository should be selected by about 1985 and it should be operational by the mid-1990's.

- The Waste Isolation Pilot Plant (WIPP) project will be cancelled since it is unlicensed and cannot accept commercial wastes. The site of the proposed project at Carlsbad, New Mexico, will be investigated further and if found qualified will be reserved for consideration along with other candidate sites in different geologic environments as a licensed repository for high level wastes.

- The safe interim storage of commercial spent fuel from nuclear power reactors will continue to be the responsibility of the utilities operating these plants until a permanent geologic repository capability exists. However, the Administration will continue to press for legislation to build or acquire limited spent fuel storage capacity at one or more away-from-reactor (AFR) facilities for those utilities unable to expand their storage capabilities and for limited amounts of foreign spent fuel when the objectives of the U.S. nonproliferation policy would be furthered.

- The Department of Energy will work with the States in their efforts to establish a reliable commercial low level radioactive waste disposal system.

- The Administration will submit legislation to extend Nuclear Regulatory Commission licensing authority to cover all DOE facilities for transuranic waste disposal and any new DOE sites for disposal of commercial low level waste. Under existing law, NRC has licensing authority over DOE facilities for disposal of high level radioactive wastes.

- Specific actions will be taken to improve and expedite regulatory actions by the Environmental Protection Agency and the Nuclear Regulatory Commission.

- The Nuclear Regulatory Commission is determing whether or not it has confidence that radioactive wastes can be disposed of safely. The President is urging the NRC to conduct its proceeding in a timely manner and to

provide full opportunity for public, technical and government agency participation.

- The President's Fiscal Year 1981 budget for the Department of Energy requests $670 million in budget authority for nuclear waste programs. Other Department and agency requests total $49 million.

A brief description of the various types of nuclear waste and the quantities buried, stored, and now being produced will be found in the background section of this Fact Sheet.

OBJECTIVES

The primary objective for waste management plannning and implementation will be that existing and future radioactive waste from military and civilian activities (including commercial spent fuel if and when it is to be discarded) should be isolated from the biosphere and pose no significant threat to public health and safety.

The following principles will guide our program:

- The technical program must meet all of the relevant radiological protection criteria, as well as any other applicable regulatory requirements. Although zero release of radionuclides or zero risk from any such release cannot be assured, such risks should fall within pre-estabblished standards and, beyond that, be reduced to the lowest level practicable.

- The responsibility for establishing a nuclear waste management program will not be deferred to future generations.

- The nuclear waste management program should explicitly include consideration of all aspects of the waste management system including safety, environmental, organizational, and institutional factors.

- The basic elements of the program should be independent of the size of the nuclear industry and of the resolution of specific fuel-cycle or reactor-design issues of the nuclear power industry.

ELEMENTS OF THE PRESIDENT'S PROGRAM

1. Relations with State and Local Governments

- the President has created, by Executive Order, a State Planning Council to advise the Executive Branch and work with the Congress in making and implementing decisions on waste management and disposal.

The council will be chaired by Governor Richard Riley. There will be 14 members who are designated by the President as follows: eight governors; five state and local government officials other than governors; and, a tribal government representative. The Secretaries of Energy, Interior, and Transportation and the Administrator of the Environmental Protection Agency are also members.

The Council will provide advice and recommendations to the President and the Secretary of Energy on nuclear waste management including interim storage of spent fuel. In particular, the Council will:

(a) Recommend procedural mechanisms for reviewing specific nuclear waste management plans and programs, including the consultation and concurrence process designed to achieve Federal, State, and local agreement which accommodates the interests of all the parties.

(b) Work on development of detailed nuclear waste management plans and provide recommendations to ensure that they adequately address the needs of affected States and local areas.

(c) Advise on all aspects of siting and licensing of facilities for storage and disposal of nuclear wastes.

(d) Advise on proposed Federal regulations, standards, and criteria related to nuclear waste management programs.

(e) Identify and make recommendations on other matters related to the transportation, storage, and disposal of nuclear wastes that the Council believes are important.

- The principle of consultation and concurrence will apply in the siting of high level waste repositories. Under the framework of consultation and concurrence, a host State will have a continuing role with regard to the Federal government's actions on the siting, design, and construction of a high level waste repository.

2. Interim Planning Strategy for High Level and Transuranic Waste Disposal

Pending reviews required by the National Environmental Policy Act and in order to provide interim guidance to the radioactive waste management program for its near-term actions and following the consideration of alternative technical approaches, the President

has adopted a comprehensive interim planning strategy. The main components of the strategy are:

- Mined geologic repositories will be the primary focus of work for safe disposal of high level radioactive waste, including unreprocessed commercial spent fuel.

- The repository program will proceed in a technically conservative step-by-step manner, from the needed technical evaluations, through site selection, independent licensing review and ultimately to opening and operating a repository.

- Immediate attention will focus on (1) research and development, both in laboratories and at sites where underground workings can be used to study rock and waste form properties and interactions, and (2) locating and characterizing potential repository sites in different geologic environments and relying on diverse rock types.

- Once four or five sites in a variety of geologic environments have been evaluated and found potentially suitable for a repository, one or more will be selected for further intensive study or characterization and development as a licensed repository.

- Ultimately, several high level waste repositories will be opened, sited regionally insofar as technical considerations related to public health and safety permit.

Prior to proceeding with the first full-scale repository, an intermediate step might be taken by disposal of a relatively small quantity of high level waste in a licensed geologic test facility in order to gain experience applicable to subsequent actions with respect to full-scale repositories. Such a facility is not an essential component of a program leading to a full-scale, high level waste repository. It would provide an option, however, to test technical readiness and to exercise elements of the licensing process after an adequate site characterization program has been completed.

Following completion of environmental reviews required by the National Environmental Policy Act, the President will reexamine this interim strategy and decide whether any changes need to be made.

Following this strategy, the choice of site for the first full-scale repository should be made about 1985 and operations should begin by the mid-1990's. These dates reflect current estimates of the minimum time required to do the work necessary, including time for licensing and to permit full State and local government and public paritcipation in decisionmaking.

The President's interim waste disposal strategy offers three important advantages:

(1) it provides maximum redundancy and conservatism so that no single or small number of setbacks would undermine the entire program, or even cause great delay;

(2) sites can be selected by comparing several locations among themselves thus providing greater confidence that the wastes will be disposed of safely;

(3) time will be available to put in place a good scientific program, to build procedures for licensing, public review and interaction, and to establish decisionmaking processes with State and local governments.

The Department of Energy is taking the following actions to implement this strategy:

- Regional, area and site investigations are being planned on a national basis to identify suitable high level waste repository sites. A variety of geologic environments and potential host rock types are being examined and this program will be expanded to ensure that the necessary sites will be available from which to select the first repository site.

- Research and development in laboratories and at test sites has been increased. Greater attention is now being given to a variety of possible waste forms, including spent fuel, to waste packaging and to waste-rock interactions under repository conditions.

- Three test facilities are planned: a granite facility in Nevada, a basalt facility in Washington State, and a salt facility at a site yet to be chosen.

The President has decided that the Waste Isolation pilot Plant (WIPP) project as currently authorized will be cancelled. This project, for which construction has not yet commenced, is currently authorized for the unlicensed disposal of transuranic waste from our National defense program and for R&D using high level waste. Reasons for the cancellation are:

- Proceeding now on the basis of a single site is inconsistent with the strategy to compare sites with differing geologic characteristics prior to selection.

- An unlicensed facility is contrary to the President's policy.

- A facility for tranasuranic waste alone would provide no useful experience relevant either to licensing or to disposal of high level waste.

- It would also be an inefficient use of funds.

The site near Carlsbad, New Mexico which was being considered for this project will continue to be evaluated and, if qualified, will be reserved, along with other sites, for possible future use as a licensed repository for high level wastes. The DOE's FY1981 budget contains funds in the commercial nuclear waste program for protection of the Carlsbad site and continued characterization activities to determine suitability as a high level waste repository.

Although mined geologic repositories will be the focal point of the comprehensive national radioactive waste management program the DOE will continue to support a limited program directed toward other disposal alternatives. These include disposition of high level wastes in very deep boreholes and emplacement in ocean sediments in regions where the ocean floor is known to be geologically stable. These alternatives are considered to be longer range options to the mined geologic repository strategy.

3. Interim Storage of Defense and Commercial High Level Wastes.

The following actions are being taken to ensure safe and adequate care of defense and commercial nuclear waste in the interim period before a disposal facility is available:

- Adequate technical and financial resources will be made available to maintain defense wastes safely.

- Research and development at various defense facilities will proceed leading to plans for processing, packaging, and ultimate transfer to permanent repositories of transuranic and high level wastes from defense programs.

- Although spent fuel storage capacity is not an alternative to a permanent disposal capability, adequate storage must be provided until repositories are available. Primary responsibility for safe storage of commercial spent fuel lies with the utility industry. However, a limited amount of government storage capacity for commercial spent fuel would be desirable to provide flexibility to the national waste disposal program and an alternative for those utilities unable to expand their storage capabilities. The President continues to seek early enactment of legislation that would authorize the Department of Energy to: (1) design, acquire or construct, and operate one or more away-from-reactor storage facilities, and (2) accept for storage, until permanent disposal facilities are

available, domestic spent fuel, and a limited amount of foreign spent fuel in cases when such action would further the objectives of our nonproliferation policy. Cost of constructing and operating away-from-reactor storage facilities will be borne by the users.

The Administration will continue to pursue both international and regional cooperative efforts to study nuclear fuel management options consistent with our nuclear nonproliferation policy.

4. Low Level Waste.

Three commercial burial grounds -- South Carolina, Washington State and Nevada -- are currently available to receive low level wastes originating in non-governmental industrial, medical and commercial activities. These have been operating intermittently because of inadequacies in waste packaging and shipment. Pressures have been mounting to find additional disposal sites to provide needed capacity for an ever-increasing inventory of commercial low level wastes.

The Department of Energy will work with the States to assist in their activities to establish regional disposal sites for low level wastes from the Nation's hospitals, research institutions, industry, and utilities. Until such time as additional disposal facilities can be sited and licensed, DOE and NRC will assist States in setting up interim storage facilities within the States. The State Planning Council will give low level waste management early, priority attention.

Other actions being taken in the area of low level waste include:

- DOE will review by 1981 alternative low level waste disposal techniques and determine whether any changes should be adopted in the future.
- DOE will accelerate R&D on improved methods of disposing of low level wastes.
- DOE will continue the existing land burial technology program presently designed to upgrade all DOE low level waste disposal operations by 1988.
- DOE will take action to ensure that adequate attention is given to the hydrologic characteristics of proposed locations for the future siting of low level waste disposal facilities.

5. Uranium Mill Tailings.

Past control of mill sites has been poor, with little or no attention to the problem of proper disposal of tailings upon completion of milling operations. The Uranium Mill Tailings

Radiation Control Act of 1978 was passed to changed this situation. EPA is directed to issue standards and criteria for disposal of mill tailings. NRC has licensing authority over active sites, and DOE is authorized to take remedial action at inactive sites.

The NRC and EPA are now developing standards, criteria, and regulations defining acceptable levels of radon emissions, siting, impacts on groundwater. The final Generic Environmental Impact Statement, (NUREG 0511, Draft issued 4/79) on uranium milling by NRC is nearing completion.

DOE, in cooperation with State governments, is now taking remedial action on abandoned tailings piles. DOE will continue to develop improved means of disposing of or stabilizing mill tailings over the long term.

6. Decontamination and Decommissioning.

As a general rule, unrestricted use of land will be the ultimate objective of D&D and institutional controls should not be relied upon after some period of time to provide long-term protection of people and the environment. However, because certain existing sites and/or facilities cannot be decontaminated at a reasonable cost, or perhaps at any cost, long-term institutional control may be required in these exceptional cases. These will require development of site-specific programs by NRC and DOE.

The following actions will be taken:

- DOE will prepare a nationwide plan for the decontamination and decommissioning of surplus facilities owned by DOE and other government agencies.

- DOE will work on designs for the construction of new facilities which will facilitate their eventual decommissioning.

- For new Federal facilities, decontamination and decommissioning specifications will be included in the initial design, and institutional arrangements will be made to ensure sufficient funding. The funding for D&D of government-owned facilities and sites will be through Federal appropriations. Responsibility and methods for financing D&D of licensed facilities will be determined by the regulatory process.

7. Transportation.

Safe and reliable transportation of nuclear wastes is an essential component of the total waste management system. While complete assurance that release of radioactive material will not occur during normal operation or in serious accidents is impossible, it has been demonstrated that it is unlikely that a

significant release can occur under most credible accident environments.

To improve the existing transportation system and enhance public confidence in it, the following actions are being taken:

- DOE is pursuing a program for testing and evaluating the performance of current and future generation waste packaging systems.

- The Department of Transportation is being directed to increase its management attention to nuclear waste matters and is completing its rulemaking on the role of Federal and local government bodies in routing of nuclear waste transportation along highways.

- DOT and NRC are working closely with the States to strengthen the nation's overall capability to respond to any transportation emergencies involving shipment of radioactive wastes.

- DOT will develop a data bank on shipment statistics and accident experience to be operational by 1982.

8. Financing.

The principle that will be applied to financing the cost of nuclear waste management and disposal is that the cost should be payed by the generator of the waste and borne by the beneficiary of the activity generating the waste. Utilities will pay the cost of storage and disposal of waste from power plant operations and pass these costs on to their customers. The government will pay the cost of storage and disposal of wastes from defense and government R&D activities and finance it from tax revenues.

9. Regulatory Actions.

The Federal programs for regulating radioactive waste storage, transportation, and disposal are a crucial component of our efforts to ensure health and safety. The following improvements are needed in the regulation of radioactive waste disposal:

- The current authority of the Nuclear Regulatory Commission to license the disposal of high level waste and low level waste in commercial facilities should be extended to also include the storage of spent fuel, as well as disposal of transuranic waste and non-defense low level waste in any new government facilities that might be built.

- The Environmental Protection Agency is responsible for creating general criteria and numerical standards applicable to nuclear waste management activities. The President has directed EPA to accelerate its schedule

for the preparation of these criteria and standards and to prepare a position paper that will indicate EPA's approach to setting standards and address the relationship between EPA's standards and actions taken by NRC and DOE.

- EPA and NRC will complete a Memorandum of Understanding dealing with coordinating methodologies and procedures.

- The Department of Transportation is responsible for regulating the transport of radioactive wastes, in part sharing that responsibility with NRC. The coordination between the two agencies is provided by an existing Memorandum of Understanding between them. DOT is completing its rulemaking on the role of Federal and local government bodies in the routing of nuclear waste transportation along highways.

- The Nuclear Regulatory Commission is now commencing a formal proceeding to determine whether or not it has confidence that radioactive wastes produced by nuclear power reactors can and will be disposed of safely. The President has urged the NRC to conduct this proceeding in a timely and thorough manner and to provide full opportunity for public, technical and government agency participation.

10. Legislation.

Legislation addressing the following areas will be submitted to Congress to implement the President's program.

- State Planning Council. To provide a permanent basis for the State Planning Council, which has been created by Executive Order.

- Licensing Extension. To implement the extension of NRC licensing authority to all new transuranic and new non-defense low level waste disposal facilities and any other facilities decided upon following the review of NRC's licensing study (NUREG 0527, September 1979).

- Low Level Waste. To assist the States in managing commercial low-level waste. The legislation will include authority for the States to enter into regional organizations or compacts for operation of the sites.

- Decommissioned Facilities Surveillance. To establish institutional responsibilities for long-term surveillance of formerly utilized Federal facilities which have been decommissioned and sold or otherwise released to unrestricted use.

The President will continue to press for authority to construct one or more away-from-reactor interim storage facilities for commercial spent fuel. This bill is already under consideration by the Congress. This legislation, or additional legislation, will implement the principle that costs of nuclear wastes disposal will be paid by the generator and borne by the beneficiary of the activity generating the waste.

11. Implementation and Management Structure.

Many Federal departments and agencies are necessarily involved in one or more aspects of nuclear waste management. In addition, the President's policy calls for full involvement of State, regional and local governments and organizations in program planning and execution. The President has designated the Secretary of Energy to be responsible for overall program integration and to establish necessary coordination mechanisms. The Secretary of Energy will assume the lead role for: (1) coordinating all Federal nonregulatory aspects of radioactive waste management; (2) working out effective relationships with regulatory bodies such as the Environmental Protection Agency and the Nuclear Regulatory Commission; and (3) developing strong and effective ties between the Federal Government and the States on all aspects of radioactive waste storage and disposal.

Within the Department of Energy, day-to-day activities are under the direction of an Assistant Secretary for Nuclear Energy (ASNE) who reports to the Under Secretary and the Secretary. Under the ASNE the Office of Nuclear Waste Management (ONWM) is responsible for executing policy and managing all aspects of the nuclear waste management program.

Regulatory responsibilities are by law assigned to the Environmental Protection Agency, the Nuclear Regulatory Commission and the Department of Transportation. The Department of Interior has authority over Federal lands that might be used for waste storage or disposal and has extensive geoscience expertise in the U.S. Geological Survey. An Interagency Working Committee has been established by the Department of Energy to coordinate and integrate associated activities of DOE, DOI, EPA, NRC, DOT, and State. The President has also instructed DOE and DOI to prepare a Memorandum of Understanding between them delineating areas of cooperation and mutual responsibility and creating procedures to ensure they work jointly and reinforce each other's activities.

The primary planning mechanism will be a comprehensive National Plan for Nuclear Waste Management. The President has directed that this be produced by 1981 and be updated biennially thereafter. It is to be submitted for public review in draft and in revised form to the public and the Congress. The plan will include:

- summaries of the status of knowledge relevant to disposal of high level, transuranic, and low level radioactive wastes and uranium mill tailings;

- multi-year program plans for (1) interim management of high level radioactive waste and spent fuel; (2) site qualification for geologic repositories, and (3) R&D in the earth sciences and waste form and containers for high level and transuranic waste disposal;

- plans for low level wastes;

- a plan for decontamination and decommissioning of surplus government facilities;

- a plan for remedial action at inactive mill tailings sites;

- an integrated NEPA plan, covering the NEPA activities of all relevant agencies;

- updated cost estimates for all proposed activities;

- proposals to improve intergovernmental decisionmaking and resolution of environmental, economic and social issues associated with radioactive waste storage, transportation, and disposal;

- specific program goals and milestones for developing necessary regulations.

The President has issued detailed instructions to all Federal agencies to ensure that his program will be implemented.

12. Public Participation.

It is essential that all aspects of the waste management program be conducted with the full disclosure to and participation by the public and the technical community. The President has directed the departments and agencies to develop and improve mechanisms to ensure such participation and public involvement consistent with any need to protect national security information and to comply fully with the National Environmental Policy Act. This includes providing technical and financial assistance to permit informed public input to programs and decisions and to support nongovernment efforts to increase social and technical understanding and agreement on nuclear waste issues. Formal mechanisms for receiving the best scientific and technical advice available and regular input from the interested public will also be strengthened.

13. International Cooperation.

Because nuclear waste management is a problem shared by many other countries and because selection of wsate management alternatives has nuclear proliferation implications, the President will continue to encourage and support cooperative bilateral and multilateral efforts which advance both our technical capabilities and our understanding of spent fuel and waste management and which are consistent with U.S. nonproliferation policy.

14. Funding.

(Funding is addressed in detail in Chapters 2 & 3 of the basic document.)

GLOSSARY

A/E	architect/engineer
AEC	Atomic Energy Commission
AFR	away-from-reactor
AGNS	Allied General Nuclear Services
ALARA	as low as reasonably achievable
AL	Albuquerque Operations Office or the site administered by that office
ANL	Argonne National Laboratory
ASEV	Assistant Secretary for the Environment
ASNE	Assistant Secretary for Nuclear Energy
BA	budget authority
BEFAST	Behavior of Fuel Assemblies in Storage
BMIS	Business Management Information System
BNL	Brookhaven National Laboratory
BPNL	Battelle Pacific Northwest Laboratory
BRP	Breeder Reactor Program
BWIP	Basalt Waste Isolation Project
CEC	Commission of the European Communities
CEQ	Council on Environmental Quality
CH	Chicago Operations Office
CH	contact handled
CMP	Comprehensive Nuclear Waste Management Program
CPS	Contractor Procurement System Reviews
CRWM	Committee on Radioactive Waste Management
CY	Calendar Year
D&D	decontamination and decommissioning
DOE	Department of Energy
DWPF	Defense Waste Processing Facility
EA	Environmental Assessment
EEC	European Economic Community
EG&G	Edgerton, Germeshausen and Grier Corporation
EIS	Environmental Impact Statement
EMAD	Engine Maintenance Assembly and Disassembly
ENICO	Exxon Nuclear Idaho Co.
EPA	Environmental Protection Agency
ER	environmental report
ERDA	Energy Research and Development Administration
ESAAB	Energy Systems Acquisition Advisory Board
EV	Office of Environment, DOE
FBR	fast breeder reactor
FUSRAP	Formally Utilized Sites Remedial Action Program
FY	fiscal year
GE	General Electric
GEIS	Generic Environmental Impact Statement
GOCO	Government-owned Contractor-operated

HEDL	Hanford Engineering Development Laboratory
HEPA	high-efficiency particulate air
HLW	high-level waste
HLLW	high-level liquid waste
IAEA	International Atomic Energy Agency
ICPP	Idaho Chemical Processing Plant
ID	Idaho Operations Office or the site administered by that office
IEA	International Energy Agency
INEL	Idaho National Engineering Laboratory
INFCE	International Nuclear Fuel Cycle Evaluation
IRG	Interagency Review Group
ISF	intermediate-scale facility
kg	kilogram
LASL	Los Alamos Scientific Laboratory
LLL	Lawrence Livermore Laboratory
LLW	low-level waste
LWR	light water reactor
m	meter
MED	Manhattan Engineer District
MTU	metric tons of uranium
NAS	National Academy of Sciences
NASAP	Nuclear Alternative Systems Assessment Program
NE	Office of Nuclear Energy
NEA	National Energy Act
NEA	Nuclear Energy Agency
NEP	National Energy Plan
NEPA	National Environmental Policy Act
NEW	Office of Nuclear Waste Management
NFS	Nuclear Fuel Services
NQAPO	Nuclear Quality Assurance Program Office
NRC	Nuclear Regulatory Commission
NSTF	Near Surface Test Facility
NTS	Nevada Test Site
NWCF	New Waste Calcining Facility
NWTS	National Waste Terminal Storage
OECD	Organization for Economic Cooperation and Development
OFPP	Office of Federal Procurement Policy
OMB	Office of Management and Budget
ONWI	Office of Nuclear Waste Isolation
ORNL	Oak Ridge National Laboratory
OSFM	Office of Surplus Facilities Management
OWI	Office of Waste Isolation
PASS	Procurement Automatic Source System
PIR	Preliminary Information Report
PMC	Program Management Contractor

PNL	Pacific Northwest Laboratory
PON	program opportunity notice
PRDA	program research and development announcement
R&D	research and development
RD&D	research, development and demonstration
RF	Rocky Flats
RH	remote-handled
RHO	Rockwell Hanford Operations
RL	Richland Operations Office or the site administered by that office
RSSF	Retrievable Surface Storage Facility
S/DB	Small and Disadvantaged Business
SAR	safety analysis report
SARP	safety analysis report for packaging
SBA	Small Business Administration
SDD	systems design description
SFMP	Surplus Facilities Management Program
SL	Sandia Laboratories
SPDV	Site and Preliminary Design Verification
SR	Savannah River Operations Office or the site administered by that office
SRL	Savannah River Laboratory
TRU	transuranic
TWTF	TRU Waste Treatment Facility
USGS	United States Geological Survey
WCF	Waste Calcining Facility
WIPP	Waste Isolation Pilot Plant
WIPAP	Waste Isolation Performance Assessment Program
WNYNSC	Western New York Nuclear Service Center

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