



# Overview of Proposed Site Treatment Plans



U.S. Department of Energy

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For more than 40 years, the United States has produced materials for nuclear weapons, operated and conducted research on nuclear reactors, and performed various nuclear experiments on reactor equipment. These activities generated both radioactive and hazardous wastes. The Department of Energy (DOE) is faced with the challenge of managing these wastes.

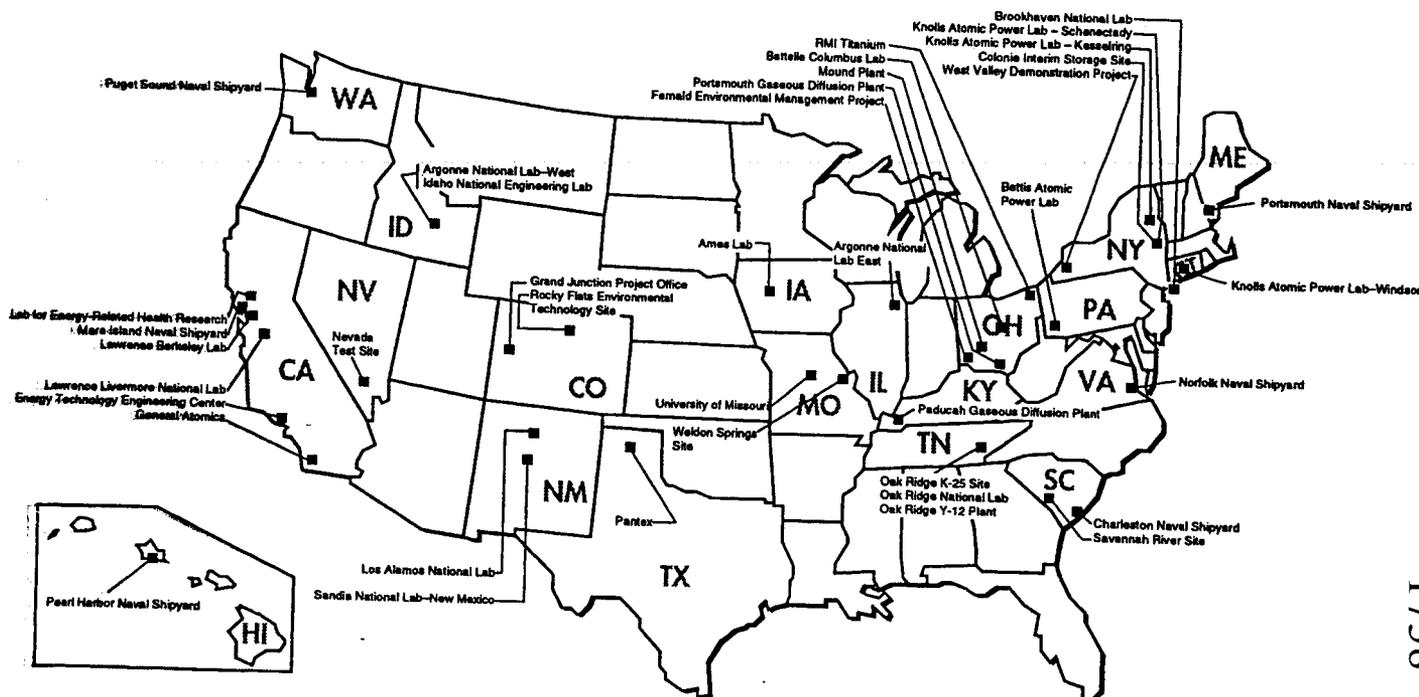
Waste that contains both a hazardous and radioactive component is identified as "mixed waste." Mixed waste can be categorized as high-level waste (HLW), mixed-transuranic waste (MTRU), or mixed low-level waste (MLLW). The management of this waste is particularly challenging to the Department. Currently, there is insufficient capacity, and in some cases a lack of available technologies, to treat these wastes to the standards required by the Resource Conservation and Recovery Act (RCRA).

DOE has prepared Site Treatment Plans to provide mixed waste treatment capacity for 40 sites in 20 States, the locations

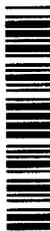
of which are shown in Figure 1. Since the passage of the FFCAct, the status of mixed waste at nine sites has changed; and, as such, these sites are no longer required to submit Site Treatment Plans. This Overview describes the process used by the sites to prepare the Proposed Site Treatment Plans and summarizes the locations, costs, and schedules for the treatment identified in these Plans.

DOE is facing increasingly uncertain funding and anticipates that funding will be even more constrained in the future. The treatment and facility schedules contained in the Proposed Site Treatment Plans reflect funding constraints as they are currently understood. DOE has invited the regulatory agencies and other stakeholders to participate in developing the Environmental Management program budget and priorities. This interaction will improve the way DOE does business and help to develop an effective Environmental Management program that uses resources wisely.

Figure 1. DOE Prepared Proposed Site Treatment Plans for 40 Sites in 20 States



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## The Federal Facility Compliance Act

The Federal Facility Compliance Act of 1992 (FFCA) requires the Secretary of Energy to develop and submit Site Treatment Plans for the development of capacity and technologies for treating mixed waste. A Plan is required for each facility at which DOE stores or generates these wastes. These Plans identify how DOE will provide the necessary mixed waste treatment capacity, including schedules for bringing new treatment facilities into operation.

The FFCA amends the Resource Conservation and Recovery Act (RCRA), the law that defines requirements for the management of hazardous waste. RCRA contains specific restrictions on the land disposal of hazardous waste, including treatment standards that must be met prior to disposal or storage. In general, DOE sites that store mixed waste are not in compliance with these land disposal restrictions because of the lack of capacity for treating mixed waste.

The FFCA also subjects Federal facilities to fines and penalties for violations of RCRA. However, DOE is not subject to fines and penalties for violations of the RCRA land disposal restrictions for mixed waste until after October 6, 1995.

DOE has followed a three-phased approach for developing its Site Treatment Plans. The National Governors' Association (NGA), through a cooperative agreement with DOE, has coordinated representatives from 20 States and the U. S. Environmental Protection Agency (EPA) to

assist the DOE sites in evaluating the candidate treatment options and developing mixed waste treatment plans.

In the first phase of this process, the Conceptual Site Treatment Plans were submitted by DOE sites to their State/Federal regulating agency in October 1993. They identified the broad range of options available to treat DOE's mixed waste.

In the second phase, the Draft Site Treatment Plans narrowed the range of treatment options and presented the individual sites' proposed options for their mixed waste. These Draft Site Treatment Plans were submitted to the States and EPA in August 1994.

DOE has now completed the third phase and submitted Proposed Site Treatment Plans to the State and Federal regulators in March 1995. DOE submitted these Plans to the state regulatory agency (or to the EPA, as appropriate) for approval, approval with modification, or disapproval. Approved Plans will be enforced through Compliance Orders, which are expected to be issued by the regulating agencies by October 6, 1995.

The Proposed Site Treatment Plans contain the treatment configuration that resulted from discussions among the States, EPA, Tribal governments and the public, and from DOE's evaluation of its treatment needs. Now that these Proposed Site Treatment Plans have been submitted, further discussions will take place to work toward the treatment configuration and schedules that will be enforced through the Compliance Orders.

## Overview of the Proposed Site Treatment Plans

This Overview presents a summary of the complex-wide treatment configuration resulting from the options presented in the

## Definitions

**Mixed Waste:** Mixed waste is waste that contains both hazardous waste and radioactive material (source, special nuclear, or by-product material as regulated by the Atomic Energy Act of 1954 [42 U.S.C. 2011 et seq.]). Mixed waste is classified by DOE according to the type of radioactive waste that it contains as either mixed low-level waste (MLLW), or mixed transuranic waste (MTRU). DOE's high-level waste (HLW) is assumed to be mixed waste because it contains hazardous components or exhibits the characteristic of corrosivity.

**Low-Level Waste:** Low-level waste (LLW) is radioactive material that is not classified as high-level waste, TRU waste, spent fuel, or uranium or thorium mill tailings.

**Transuranic Waste:** Transuranic waste (TRU) refers to radioactive materials contaminated with greater than 100

nanocuries per gram of alpha-emitting radionuclides with half-lives greater than 20 years.

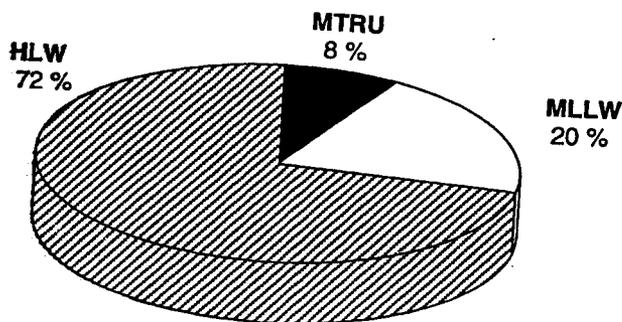
**High-Level Waste:** High-level waste (HLW) is highly radioactive material containing fission products, traces of uranium and plutonium, and other transuranic elements, that result from chemical processing of spent nuclear fuel.

**Life Cycle Cost:** The life cycle cost is the sum total of costs estimated to be incurred in the design, development, production, operation, maintenance, support, and final disposition of a major system over its anticipated useful life span.

**Constant Dollars:** Constant dollars are a unit of cost measurement in which the current value of the dollar is assumed to remain unchanged in the future. Constant dollars in this Overview use fiscal year 1994 as the current dollar value.

Proposed Site Treatment Plans. As shown in Figure 2, 72 percent of DOE's mixed waste is high-level waste (HLW), 20 percent is mixed low-level waste (MLLW), and 8 percent is mixed transuranic (MTRU).

**Figure 2: Relative Volumes of Mixed Waste Types**



Current Inventory Plus Five-Year Projections

Although the majority of DOE's mixed waste (51 percent) is located at the Hanford site in Washington, the site did not prepare a Site Treatment Plan. Because the Hanford site had an agreement in place with its regulators for treating its mixed waste, it was not required by the FFCAct to prepare a Site Treatment Plan. Some sites preparing Site Treatment Plans are, however, proposing Hanford facilities for the treatment of their wastes. Therefore, Hanford wastes and facilities are included in this Overview.

The Proposed Site Treatment Plans are consistent with the current strategies being developed for the treatment of DOE's HLW. HLW is managed at four sites (the Hanford site in Washington, the Savannah River site in South Carolina, the West Valley Demonstration Project in New York, and the Idaho National Engineering Laboratory in Idaho). HLW will only be transported from these sites as a stable solid waste form ready for disposal.

The Proposed Site Treatment Plans are also consistent with DOE's current policy that defense related MTRU waste will be disposed at the Waste Isolation Pilot Plant (WIPP) using the No Migration Variance and will not require treatment to meet the land disposal restriction standards. The Proposed Site Treatment Plans identify the characterization and processing of MTRU waste required to meet the WIPP Waste Acceptance Criteria. The Proposed Site Treatment Plans also include options for treatment of non-defense MTRU waste to meet the land disposal restrictions. However, they recognize the need for modifications if there are variations in the WIPP disposal requirements.

The Draft Site Treatment Plans presented site-preferred MLLW treatment options and, when viewed from a national level, contained redundancies and inefficiencies. In developing the Proposed Site Treatment Plans, an evaluation was performed to determine what accommodations were necessary to blend the configuration presented in the Draft Site Treatment Plans into a national configuration of treatment systems. Because there are existing strategies to address HLW and MTRU, the focus of this evaluation was on identifying the facilities and locations to treat MLLW to land disposal restriction standards. However, specific treatment technologies have not been identified for some of those facilities. Treatment technologies are being evaluated and will be identified through implementation of the Plans and through further discussions with the States, EPA, Tribal governments, and the public.

To facilitate this evaluation, a team was established comprised of site representatives and members of the DOE Headquarters FFCAct Task Force. The team coordinated their efforts with the States through the National Governors' Association to ensure that both the States' and DOE's values were considered in developing the national mixed waste treatment configuration.

The resulting Proposed Site Treatment Plans (plus Hanford) identify on-site treatment for 95 percent of the total mixed waste volume. Over 76 percent of DOE's MLLW would be treated on site, with 98.4 percent of DOE's MLLW being treated in the State where it is stored or generated. Only 2,100 cubic meters of MLLW (1.6 percent of the total DOE MLLW volume) is proposed for treatment out-of-State. The majority of that waste (1,950 cubic meters) would be sent to Idaho and Tennessee. Approximately 22 percent of the total MLLW volume does not yet have a specified treatment location, primarily due to the examination of commercial treatment options, the locations of which have not yet been determined. An additional small volume of waste with an unspecified treatment location requires additional characterization before a treatment location can be identified. Table 1 presents the volumes of MLLW that would be treated in-State, in new or existing systems, and where wastes being shipped out of State would be treated.

The total life-cycle cost for treating mixed waste identified in the Proposed Site Treatment Plans, plus mixed waste treatment at the Hanford site, is estimated at \$50.3 billion in fiscal year 1994 constant dollars. Approximately 85 percent of the total cost (\$42.7 billion) is for the treatment of HLW. MTRU and MLLW account for 7 percent and 8 percent of the total cost, respectively. These cost estimates do not reflect anticipated savings achieved through improvements in operations. As the

sites identify specific opportunities for improvements, cost estimates will be refined.

The largest new costs resulting from the Proposed Site Treatment Plans are for 15 major new treatment facilities, each with an estimated life cycle cost of greater than \$50 million (constant dollars). The Hanford site is also proposing new major treatment facilities; however, these facilities are covered under an existing agreement and do not represent new funding commitments.

Excluding Hanford, the 15 major treatment facilities account for approximately 93 percent of the total cost of proposed new facilities and would treat 82 percent of the mixed waste proposed for treatment in new facilities. Large MLLW facilities are proposed at Idaho National Engineering Laboratory, Rocky

Flats, Savannah River, and Lawrence Livermore National Laboratory, plus new commercialized treatment facilities being examined by the Oak Ridge site. Major MTRU facilities are proposed at Oak Ridge, Savannah River, Idaho National Engineering Laboratory/Argonne-West, and Los Alamos National Laboratory. A HLW facility is proposed at the Idaho National Engineering Laboratory.

The current funding assumptions used to prepare the Proposed Site Treatment Plans differ from those used during the first two years of the Site Treatment Plan development process. Under the currently projected funding targets, schedules in the Proposed Site Treatment Plans for some facilities, particularly the largest and most costly facilities, are significantly delayed compared to schedules in the Draft Plans. Treatment schedules for small sites that rely on the capacity at these larger sites

**Table 1. Mixed Low-Level Waste Treatment by State**  
Waste Volumes in Cubic Meters—Current Inventory Plus Five-Year Projections

STATE	DOE WASTE TREATED IN STATE		STATES RECEIVING WASTE FROM OUT-OF-STATE DOE SITES								TREATMENT LOCATION NOT SPECIFIED	TOTAL
	In Existing Systems	In New Systems	FL	ID	NM	SC	TN	TX	UT	WA		
California	1,990.2	83.1		179.3			0.7			33.2	33.3	2,319.8
Colorado	1,887.9	15,428.8		157.2			90.0				0.0*	17,563.9
Connecticut				5.1		3.6				4.3		13.0
Hawaii				0.1				16.0		4.5		20.6
Iowa								0.2		0.0*		0.2
Idaho	633.3	26,002.3									2.2	26,637.8
Illinois	16.2	131.2					3.1					150.5
Kentucky	8.4	85.7					320.5				617.7	1,032.3
Maine						0.0*				2.3		2.3
Missouri	1,960.5						61.5			1.8		2,023.8
New Mexico	56.2	197.4					18.4				401.1	673.1
Nevada			0.3								297.8	298.1
New York	6.0	0.6		30.7		9.3	9.0	1.7	5.7	8.9	95.0	166.9
Ohio	1,249.9	12,744.4		11.5			962.7		8.8	13.3	275.5	15,266.1
Pennsylvania				13.8		2.0						15.8
South Carolina	7,802.9	5,664.5		7.9	0.8						491.8	13,967.9
Tennessee	3,531.4	2,519.1									26,200.9	32,251.4
Texas	70.6	774.8										845.4
Virginia				9.8		2.1						11.9
Washington		15,904.6		19.0			36.0					15,959.6
STATE TOTALS	19,213.5	79,536.5	0.3	434.4	0.8	17.0	1,518.1	1.7	14.5	68.3	28,415.3	129,220.4

\* Waste Volume < 0.05 m<sup>3</sup>

are also affected. DOE is providing its State and Federal regulators, as well as other interested parties, an opportunity to participate in prioritizing its Environmental Management activities, including mixed waste treatment, in support of fiscal year 1997 budget development. DOE expects that for some sites further discussion with the State and Federal regulators concerning priorities will result in modified schedules in the approved Plans. For example, schedules in the Proposed Site Treatment Plans for the MTRU treatment facilities are not currently integrated with the schedule for opening and closing WIPP, and discussions with the regulators and the public may result in changes to these schedules.

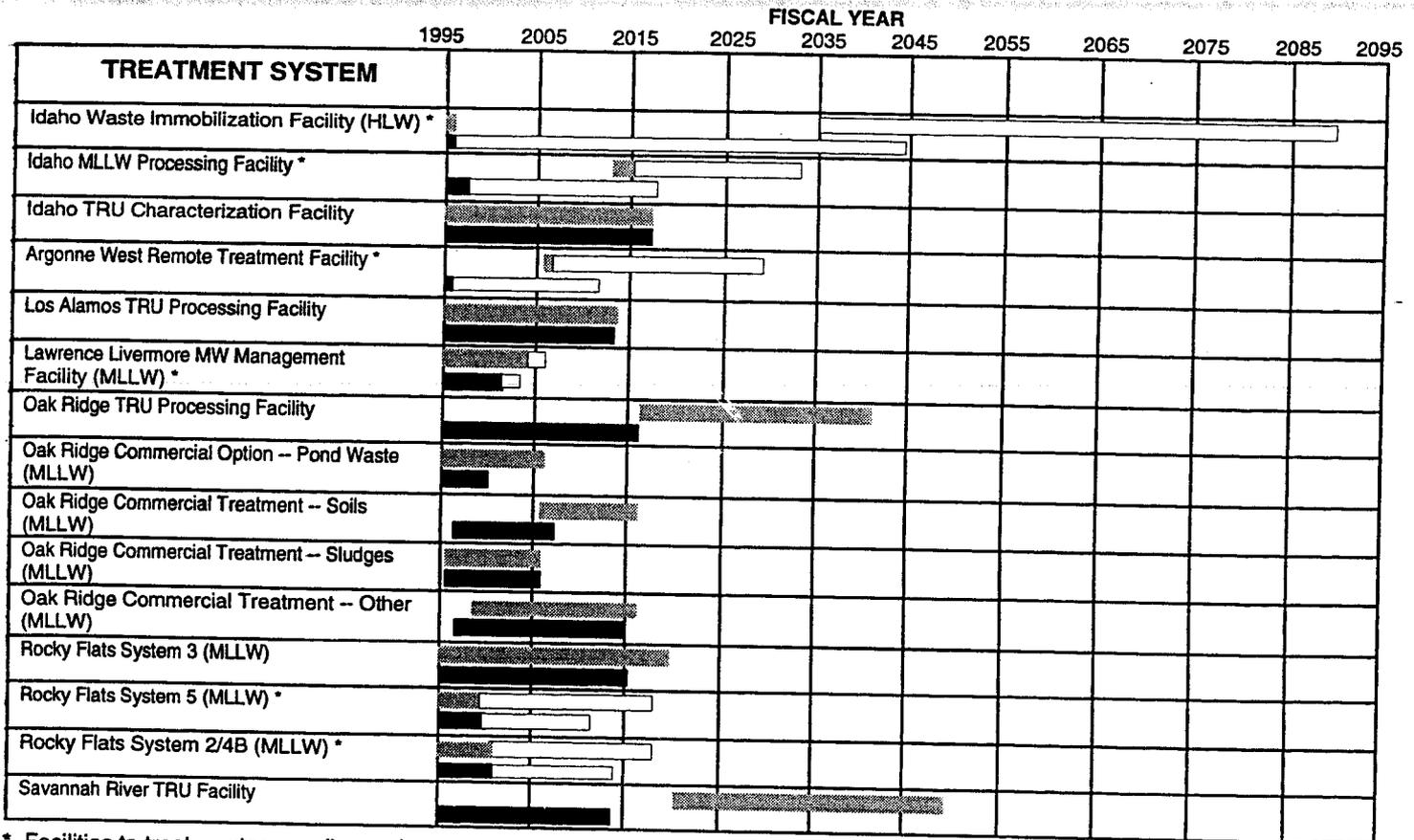
Figure 3 shows the schedules in the Proposed Site Treatment Plans, constrained by current Waste Management program funding targets, for the 15 major new treatment facilities and the schedules that the sites were considering prior to the projected funding limitations. Although the majority of the sched-

ule changes occur for the major new facilities, schedules for some of the smaller facilities have also been delayed. Excluding Idaho's Waste Immobilization Facility, which would not complete treatment until the year 2088, treatment in the 15 large facilities would be completed by 2050.

For waste for which treatment technology does not exist, the FFCAct requires schedules for research and development, rather than schedules for treatment, to be included in the Plans. Projected post-research and development schedules are shown in Figure 3 for comparison and planning purposes, but are not part of the Proposed Site Treatment Plans, and may change as a result of research and development activities. The Proposed Site Treatment Plans for the following facilities include only schedules for research and development activities:

- Idaho Waste Immobilization Facility
- Idaho MLLW Waste Processing Facility

**Figure 3. Proposed Site Treatment Plan Schedules**  
Comparison of PSTP Schedules with Previous Draft Schedules



\* Facilities to treat wastes needing technology development; schedules include R&D only. Other facility schedules include planning, design, construction, and operation.

Proposed Site Treatment Plan Schedule Previous Draft Schedule Projected Post-R&D Schedule

- Argonne-West Remote Treatment Facility
- Lawrence Livermore Mixed Waste Management Facility
- Two Rocky Flats Facilities: System 5 and System 2/4B

The Proposed Site Treatment Plans for some additional sites' new facilities will follow this same research and development scheduling approach, but are not among the 15 major new facilities.

## Implementation of the Site Treatment Plans

Once the Site Treatment Plans are approved, the FFCAct requires the regulatory agencies to issue Orders requiring compliance with the Plans. In view of its significant funding limitations, DOE intends to seek a process for implementing the Plans that provides accountability, focuses resources on high priority activities, and recognizes fiscal and technical realities. One element of DOE's proposal is to establish enforceable "milestones" only for near-term activities when technical aspects and funding are more certain. The milestones would be reviewed annually with the regulatory agency to consider factors such as funding availability; the latest technical and cost information; site priorities identified through consultations among DOE, regulatory agencies, and stakeholders; new or emerging technologies; and other relevant factors, and would be revised as appropriate.

## Relationship between the FFCAct and Other Initiatives

Concurrent with the FFCAct process, DOE has been pursuing two related major initiatives, the Waste Management Programmatic Environmental Impact Statement (PEIS) and the Baseline Environmental Management Report (BEMR).

DOE is undertaking a programmatic environmental impact analysis of alternative strategies for waste management activities in the Waste Management PEIS. The PEIS, being developed in accordance with the provisions of the National Environmental Policy Act, will include an evaluation of the potential environmental impacts of waste management activities at a broad level. The draft PEIS is scheduled to be released in May 1995 and finalized in late 1995.

The other related major initiative is the Baseline Environmental Management Report. The Report, developed in response to a Congressional requirement, will address the environmental liabilities of the DOE complex and provide an estimated cost for all DOE Environmental Management activities. The Report reflects the activities that DOE field offices currently ex-

pect to carry out and alternative cases developed by DOE showing the potential cost variations from four key factors: future land use, scheduling, technology development, and the waste management configuration. The Report was submitted to Congress at the end of March 1995.

The FFCAct efforts address only mixed waste treatment within the Waste Management program. The Programmatic Environmental Impact Statement, although also evaluating the Waste Management program, has a broader perspective in that it addresses five different waste types and treatment, storage, and disposal alternatives for those waste types. The Baseline Environmental Management Report is broader still, addressing all of the Environmental Management programs, including Compliance, Waste Management, Environmental Restoration, Technology Development, and Nuclear Material and Facility Stabilization. By estimating total life-cycle costs for Environmental Management programs, including costs of environmental liabilities and regulatory commitments, the Baseline Environmental Management Report highlights the challenges facing DOE in managing its wastes, cleaning up its contaminated property, considering future land use, and budgeting resources to meet these challenges.

## Disposal

Established processes are being implemented by DOE for studying, designing, constructing, and ultimately operating disposal facilities for HLW and MTRU wastes (specifically the HLW repository in Nevada, and the Waste Isolation Pilot Plant in New Mexico).

Although the FFCAct does not require DOE to address disposal of treated mixed waste, both DOE and the States recognized that disposal issues are an integral part of mixed waste management activities. Currently there are no active permitted mixed waste disposal facilities operated by DOE for disposal of residuals from the treatment of MLLW. Through the Site Treatment Plan development process, DOE and State and Federal regulators have formed working groups to evaluate issues related to disposal of treated MLLW. These workgroups have defined criteria to evaluate the sites subject to the FFCAct in order to identify sites that may be suitable for disposal of these residuals. Evaluation of these facilities and determination of potential disposal locations is continuing. A description of the disposal process and its status is included in the individual site Proposed Site Treatment Plans.

## Next Steps

The Proposed Site Treatment Plans have been submitted to the State/EPA regulators for their approval, approval with modification, or disapproval. The regulators are expected to issue Orders requiring compliance with the Plans by October 6, 1995. As discussions among DOE, its regulators, Tribal governments, and the public continue, it is expected that modifications and improvements will be made to the treatment configuration and schedules described in the Plans.

DOE intends to continue its dialogue with the State/EPA regulators in working to finalize the Plans, leading to issuance of the Compliance Orders. To ensure that the FFCAct process moves forward and that common goals are attained, DOE anticipates that the following steps will be taken in the near term:

- Determine, with the States, EPA, Tribes, and the public, the priorities of the Environmental Management program at each site.
- Revise facility schedules to reflect these priorities and funding limitations.
- Continue a cooperative process under the FFCAct beyond the release of the Proposed Site Treatment Plans to build on the progress that has been made to date.

In the long-term, the current process should evolve into a new way of doing business that consists of open communication with the regulators on both a local and national level, joint resolution of issues, and working toward common goals. Much work must still be done to address challenging issues such as implementation, funding, prioritization, and equity. However, there is a solid process in place to move forward through cooperation and regular communication between DOE, its regulators, and the public.

General information on a site's Proposed Site Treatment Plan, locations of DOE reading rooms where the Plans may be viewed, and addresses of regulators to whom comments on specific Plans should be sent, can be obtained from the Center for Environmental Management Information at 1-800-7EM-DATA (1-800-736-3282).

Additional information about the FFCAct may also be obtained electronically through the FFCAct Bulletin Board on the Internet at <http://eagle.haz.ornl.gov/ffcabb/ffcmain.html>.

Comments on DOE's Proposed Site Treatment Plans will be considered by the appropriate regulatory agency in reviewing the Plans. Written comments on the Plans should be sent to the State/Federal recipients by July 6, 1995.