

## DOE'S PLANNING PROCESS FOR MIXED LOW-LEVEL WASTE DISPOSAL\*

Joel T. Case, DOE/Idaho Operations Office, Marty J. Letourneau, DOE/EM-33, and Margaret S.Y. Chu, Sandia National Laboratories

## ABSTRACT

A disposal planning process was established by the Department of Energy (DOE) Mixed Low-Level Waste (MLLW) Disposal Workgroup. The process, jointly developed with the States, includes three steps: site-screening, site-evaluation, and configuration study. As a result of the screening process, 28 sites have been eliminated from further consideration for MLLW disposal and 4 sites have been assigned a lower priority for evaluation. Currently 16 sites are being evaluated by the DOE for their potential strengths and weaknesses as MLLW disposal sites. The results of the evaluation will provide a general idea of the technical capability of the 16 disposal sites; the results can also be used to identify which treated MLLW streams can be disposed on-site and which should be disposed of off-site. The information will then serve as the basis for a disposal configuration study, which includes analysis of both technical as well as non-technical issues, that will lead to the ultimate decision on MLLW disposal site locations.

## BACKGROUND

The Federal Facility Compliance Act (FFCAct) of 1992 requires the Secretary of Energy to develop and submit site treatment plans (STPs) for the development of both treatment capacity and technologies for treating mixed waste for each facility at which DOE stores or generates these wastes. These plans will identify how DOE will provide the necessary mixed waste capacity, including schedules for bringing new treatment facilities into operation. In collaboration with representatives from the States and the National Governors' Association (NGA), DOE has been evaluating candidate treatment options and developing these treatment plans.

Although the FFCAct does not specifically require DOE to address disposal of treated mixed waste, both DOE and the States realize that disposal issues are an integral component of treatment discussions and have representatives working on and discussing disposal issues. DOE established the FFCAct Disposal Working Group (DWG) in June 1993 to work with the States to define and develop a process for evaluating disposal options. The focus of the DWG process and discussions on disposal with the States has been to identify, from among the sites currently storing or expected to generate MLLW, sites that are suitable for further evaluation regarding their disposal capability. Sites considered to have marginal or no potential for disposal activities have been removed or postponed from further evaluation under this process. Remaining sites are being evaluated more extensively to define the technical capabilities of the sites. Ultimately, a number of sites are expected to be technically acceptable for disposal activities.

This paper describes how the disposal planning process was established, major activities from June 1993 to the present, progress to date, and the expected results from this process.

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## STEP 1: SCREENING PROCESS FOR POTENTIAL DISPOSAL SITES

The process adopted by the DWG for evaluating disposal options is summarized in Figure 1. In October, 1993, DOE prepared a draft report "Framework for DOE Low-Level and Mixed Low-Level Waste Disposal: Current Overview" (DOE, 1993) describing the history and status of DOE's low-level and mixed -low-level waste disposal and also outlining a disposal planning process. The sites originally evaluated in this process were the 49 sites reported to Congress by DOE in the Mixed Waste Inventory Report (MWIR) (April 1993) as currently storing or expected to generate MLLW. In the initial step of this process, sites that were in geographic proximity were combined into a single site for consideration in subsequent steps. The following sites were combined:

- Lawrence Livermore National Laboratory and Sandia National Laboratories, California;
- Idaho National Engineering Laboratory and Argonne National Laboratory (West);
- Sandia National Laboratories, New Mexico, and Inhalation Toxicology Research Institute; and
- Oak Ridge National Laboratory, Oak Ridge K-25 Site, and Oak Ridge Y-12 Site

This grouping reduced the number of sites to 44.

The next step was the establishment of a screening process using exclusionary criteria for the 44 remaining sites. These criteria were developed by reviewing Federal and State laws regarding the siting of waste treatment, storage, and disposal facilities to determine whether any criteria existed which could be considered exclusionary minimum requirements for hosting disposal activities and which could be applied uniformly across sites. It was agreed at a joint DOE/States meeting in Tucson, Arizona, on March 3-4, 1994, that in order to be further evaluated for potential disposal activities, a site:

- must not be located within a 100-year floodplain,
- must not be located within 61 meters of an active fault, and
- must have sufficient area to accommodate a 100-meter buffer zone.

The first criterion is derived from regulatory requirements under the Resource Conservation and Recovery Act (RCRA) and the U.S. Nuclear Regulatory Commission (NRC) which restrict the location of waste disposal facilities. The second criterion is derived from the requirements under RCRA which restrict the location of waste storage, treatment, and disposal facilities. The third criterion is derived from guidance from the U.S. Environmental Protection Agency, U.S. NRC and U.S. DOE concerning the minimum area required to properly operate such facilities.

Application of the three exclusionary criteria identified 18 sites that did not meet the criteria. The results were presented at a March 30-31, 1994, joint DOE/States meeting in Dallas, Texas. At the meeting, it was agreed that the 18 sites would be removed from further evaluation and that DOE would prepare "fact sheets" on the remaining 26 sites to provide additional site-specific information for identifying the strengths and weaknesses of the remaining sites for the purpose of disposal activities.

PLACE FIG. 1 HERE.

A predecisional draft of the report "Framework for DOE Mixed Low-Level Waste Disposal: Site Fact Sheets" (Gruebel et al., 1994) was prepared by the DOE and forwarded for comment and review on July 13, 1994, to the State representatives who had been discussing the disposal issues with DOE for further consideration as potential disposal sites. The DOE and the State representatives met on July 26-27, 1994, in Denver, Colorado, to discuss the Fact Sheet report and to consider proposals for elimination of sites from further evaluation. Prior to the meeting, the DWG had reviewed the information in the Site Fact Sheets and evaluated the 26 sites according to the following methodology:

- (A) The factors contained in the fact sheets were grouped into three categories:
1. Technical Considerations—factors that represent the technical ability of a site to accommodate the waste disposal facility and minimize the risk of releases of waste constituents from the disposal facility (e.g., precipitation and evapotranspiration, tectonic and volcanic hazard potential, soil stability and topography, flooding potential, groundwater hydrology [depth to groundwater]).
  2. Potential Receptor Considerations—factors that gauge the potential magnitude of consequences in the event a disposal site ceases to function properly (e.g., population, significant groundwater resources, sensitive environment).
  3. Practical Considerations—factors that can potentially affect the development and long-term management of a disposal site (ownership, mission, MLLW storage and generation, regulatory considerations).
- (B) Each of the 26 sites was evaluated by the DWG according to the three categories. One of three results was assigned for each grouping: the site posed (1) a major problem, (2) a moderate problem, or (3) a minor problem. Major problems were defined as having features or attributes that make developing and operating a disposal facility extraordinarily difficult. Moderate problems were defined as significant problems that could likely be solved with additional efforts and resources. Sites designated as having minor problems were those with neither major nor moderate problems.

Based on the DWG evaluation, during the July 1994 meeting the DOE proposed to the States that 9 additional sites be eliminated from further consideration. The DOE and the States were able to agree that the following sites would be eliminated from further evaluation under this process regarding the sites' disposal capabilities:

<u>Site</u>	<u>State</u>
Energy Technology Engineering Center	California
General Atomics	California
General Electric Vallecitos Nuclear Center	California
Pinellas Plant	Florida
Site A/Plot M	Illinois

Additionally, DOE and the States agreed that due to its geographic proximity, the Knolls Atomic Power Laboratory at Niskayuna, New York, would be merged with the Knolls Atomic Power Laboratory at Kesselring, New York, for purposes of further analysis. The DOE and the States also agreed that the following sites, while not eliminated from further evaluation, would be given a lower priority for further evaluation:

<u>Site</u>	<u>State</u>
Weldon Spring Remedial Action Project	Missouri
Brookhaven National Laboratory	New York
Mound Plant	Ohio
Bettis Atomic Power Laboratory	Pennsylvania

Sites assigned a lower priority for further evaluation had issues that required further consideration, including whether the technical abilities of the site were adequately known, the volume of MLLW that may be generated by the site had been determined, and other arrangements for disposal of the sites' MLLW were adequate. The DOE and the States agreed to further evaluate these sites in terms of their ability to dispose of their own MLLW on-site only if no other options for disposal of their wastes could be identified through the disposal evaluation process. In no case would these sites be considered as a disposal option for wastes from other sites, and could be eliminated from further analysis should sufficient information suggest that their potential for disposal activities is too limited.

## STEP 2: EVALUATION PROCESS FOR POTENTIAL DISPOSAL SITES

For the sites not eliminated from further evaluation or assigned a lower priority for evaluation, a more technically detailed analysis (performance evaluation) is being conducted to increase understanding of the strengths and weaknesses of a site's potential for disposal and to better identify what types of disposal activities could or could not occur at a site. The performance evaluation to be conducted for each of the remaining sites entails the collection of site-specific data related to the natural surroundings, geotechnical setting, groundwater and surface water characteristics, and other factors related to the disposal capabilities of each site. The sites being carried forward in this analysis are the following (Figure 2):

<u>Site</u>	<u>State</u>
Lawrence Livermore National Laboratory, Site 300	California
Rocky Flats Environmental Technology Site	Colorado
Idaho National Engineering Laboratory	Idaho
Argonne National Laboratory	Illinois
Paducah Gaseous Diffusion Plant	Kentucky
Nevada Test Site	Nevada
Los Alamos National Laboratory	New Mexico
Sandia National Laboratories	New Mexico
Knolls Atomic Power Laboratory—Kesselring	New York
West Valley Demonstration Project	New York
Fernald Environmental Management Project	Ohio
Portsmouth Gaseous Diffusion Plant	Ohio

Savannah River Site  
Oak Ridge Reservation  
Pantex Plant  
Hanford Site

South Carolina  
Tennessee  
Texas  
Washington

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The goal of the performance evaluation analysis is to quantify and compare the limitations of 16 DOE sites for the disposal of MLLW. The objective is, therefore, to use a set of modeling assumptions of sufficient detail to capture major site-specific characteristics and yet be general enough for consistent application at all sites. The results of the performance evaluation will be represented in terms of concentrations of radionuclides in MLLW streams that a site can accept without violating the performance objectives prescribed in DOE Order 5820.2A. This information will be used to evaluate the sites and estimate the types of waste that may be disposed of at a given site. (It is important to note that although a performance evaluation is planned for the West Valley Demonstration Project (WVDP) site, only on-site wastes will be considered because the WVDP Act prohibits the site from accepting off-site wastes). The performance evaluations of the 16 sites were initiated in August 1994, and are scheduled to be completed in June 1995. A progress report on the performance evaluation task will be issued during the PSTP process and a final report documenting the performance evaluation results will be issued in October 1995.

An important component in the performance evaluation step is the involvement of a Senior Review Panel. The Panel is established to provide independent review of the PE analysis. The panel consists of six highly reputable technical experts in various aspects of waste disposal. Five members of the panel were selected by DOE, and one member was selected by the National Governors Association. Two technical reviews have been performed to date, and two more are planned before the completion of the PE analysis.

### STEP 3: CONFIGURATION STUDY

As illustrated in Figure 1, much progress has been made in the disposal planning process. However, much work remains to be completed. The following steps outline the future activities after the performance evaluation that need to be completed in order to make an informed decision about the disposal of DOE MLLW. Coordination with the States will continue in the next steps in order to gain stakeholder input and to resolve issues at the earliest possible stage.

#### Develop Estimates of Waste Volumes and Radionuclide Concentrations in treated MLLW residues

Once treated methods for the MLLW waste streams are finalized through the FFCAct process, estimates of treated residue volumes and radionuclide concentrations in the treated residues will be developed for all waste streams. These estimates are needed to compare to the radionuclide concentration guidelines derived in the performance evaluation.

## Compare Radionuclide Concentration in Treated Residue Estimates to Radionuclide Concentration Guidelines Derived in the Performance Evaluation

Radionuclide concentrations for each treated waste streams will be compare to those disposal values derived in the performance evaluation. Analysis will identify sites with on-site disposal capabilities and the treated waste streams they will be able to dispose on-site. Also the analysis will evaluate off-site DOE and commercial disposal capacity for those treated waste streams which cannot be disposed on-site.

## Develop Sample Configuration for Disposal of Treated Residuals

Sample complex-wide configurations will be developed for the disposal of treated MLLW residuals. These configurations will take into account such technical issues as compatibility of radionuclides and capacity to handle projected residual volumes. Other types of issues will be weighed during the configuration discussions such as transportation distances and costs. Information from the DOE EM Programmatic Environmental Impact Statement (PEIS) will be included here. In addition, input from the States will be an important component in this step.

## Develop a Draft Disposal System Configuration

Using the sample configurations as a basis, in coordination with NEPA requirements and with State and stakeholder input, a draft disposal system configuration will be developed. This configuration will be the basis for determining future funding and schedules for proposed disposal facilities.

## INTEGRATION WITH THE STP PROCESS

The FFCAct does not require disposal to be included in the STPs; however, given the complex issues involved, DOE recognizes the importance of State input to facilitate resolution of issues related to disposal. Information on the disposal planning process is provided in the PSTP to continue to involve the States and to make them aware of DOE's continued work on this issue. A progress report describing this planning process and, in detail, the performance evaluation methodology is being prepared as part of the PSTP. Results of the performance evaluation for the 16 sites will be provided to the States when Compliance Orders are issued in October, 1995.

## REFERENCES

1. Federal Facility Compliance Act of 1992, P.L. 102-386 (Oct. 1992).
2. Framework for DOE Low-Level and Mixed Low-Level Waste Disposal: Current Overview, DOE/ID-10484 (June 1994).
3. U.S. Department of Energy Mixed Waste Inventory Report (April 1993).
4. M. GRUEBEL, R.D. WATERS, M. HOSPELHORN, M. CHU, eds., "Framework for DOE Low-Level and Mixed Low-Level Waste Disposal: Site Fact Sheets," Sandia National Laboratories, SAND94-2728 (Nov. 1994).

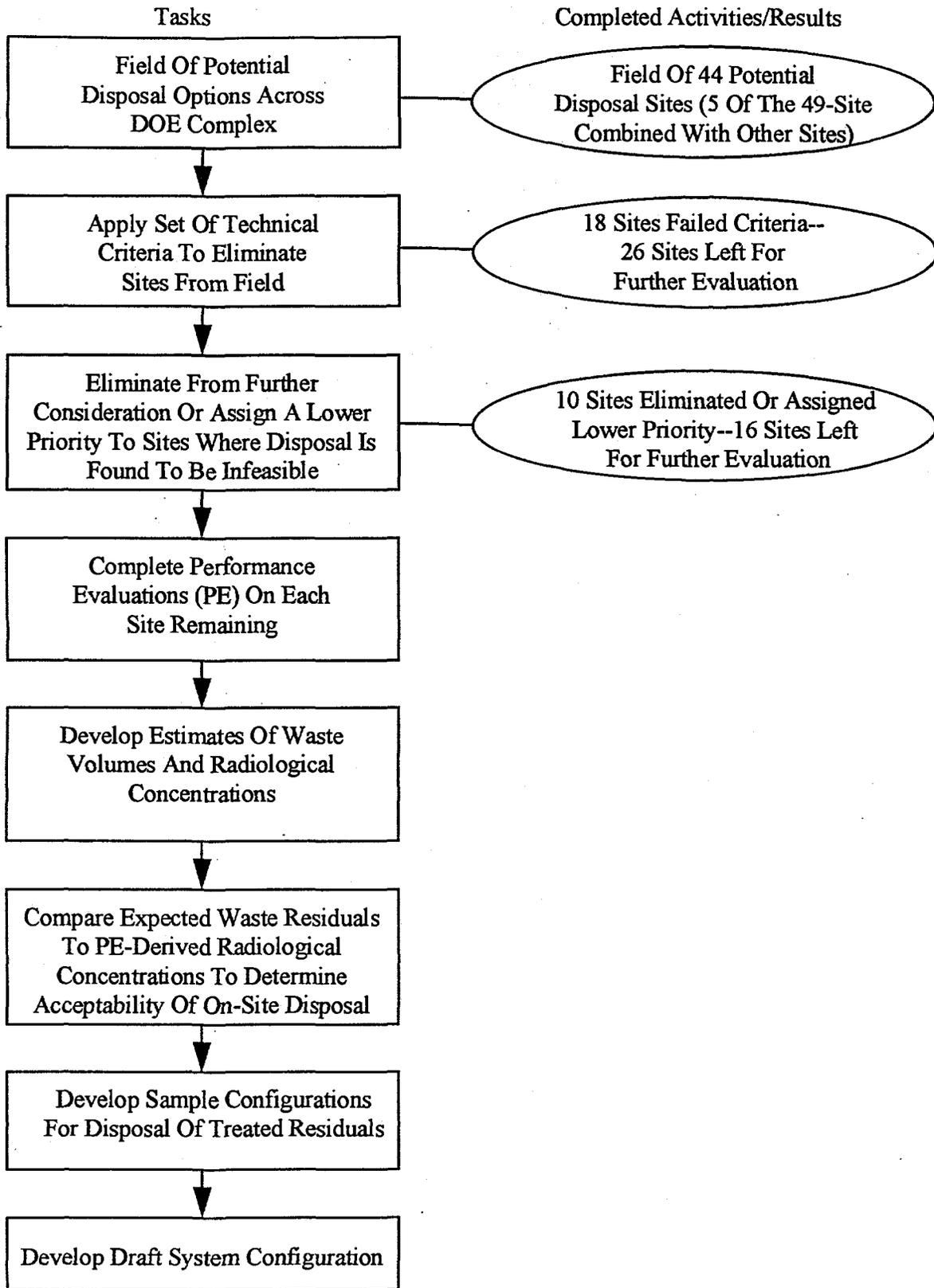


Fig. 1. Disposal Planning Process

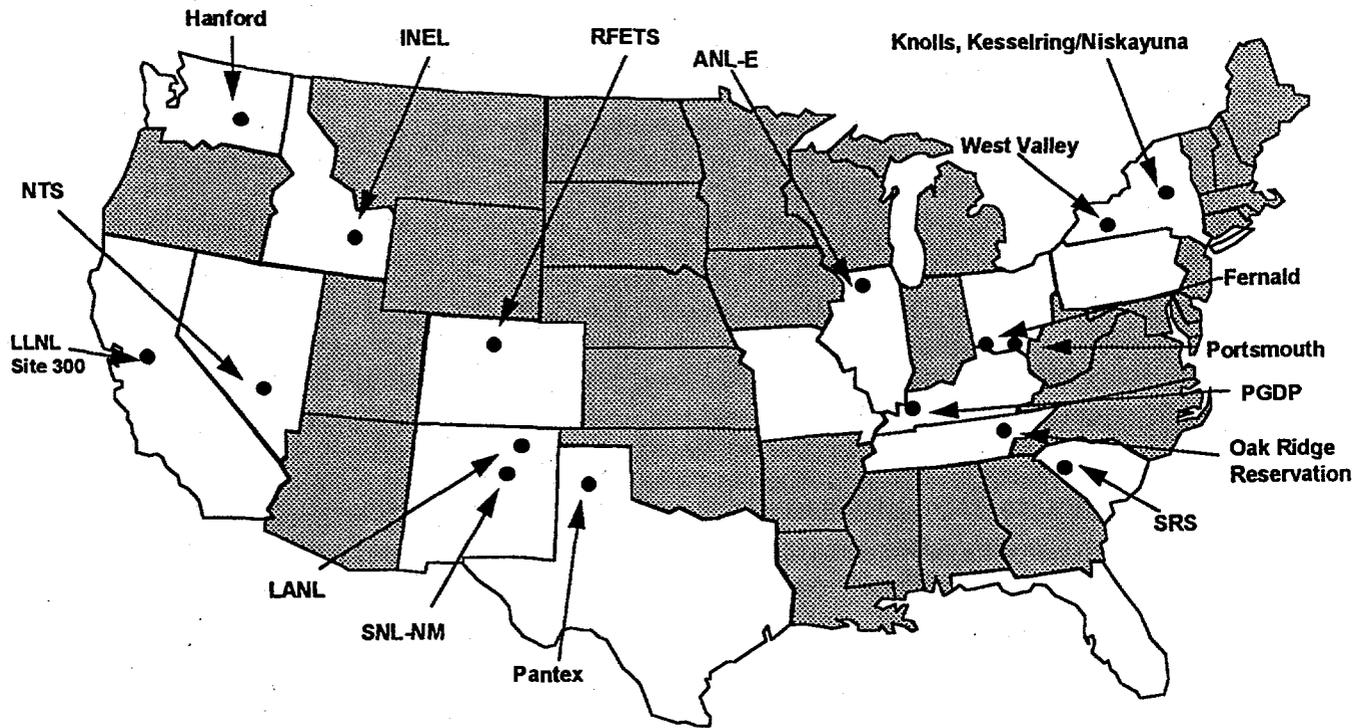


Fig. 2. 16 sites remaining in the evaluation process

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