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NRC TASK FORCE REPORT ON REVIEW OF THE FEDERAL/STATE PROGRAM FOR REGULATION OF COMMERCIAL LOW-LEVEL RADIOACTIVE WASTE BURIAL GROUNDS

Richard Smith
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Office of Nuclear Material Safety and Safeguards
and
Office of State Programs
U. S. Nuclear Regulatory Commission

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This document is a report of an NRC task force. The NRC has the recommendations of the report under consideration. The report has been published for the purpose of informing the public of the recommendations and obtaining public comment which will be considered during the deliberative process.

U.S. NUCLEAR REGULATORY COMMISSION (NRC)

TASK FORCE ON REVIEW OF THE FEDERAL/STATE PROGRAM FOR REGULATION OF THE COMMERCIAL LOW-LEVEL RADIOACTIVE WASTE BURIAL GROUNDS

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EXECUTIVE SUMMARY

This is the report of the Nuclear Regulatory Commission (NRC) Task Force which examined the programs of the NRC and Agreement State governments to regulate the disposal of commercial low-level radioactive waste. This report is part of the overall NRC examination of waste management and is responsive to issues raised by the General Accounting Office (GAO), the Joint Committee on Atomic Energy (JCAE) and the House Committee on Government Operations.

The underlying issue explored in this report is that of Federal vs State regulation of commercial radioactive waste burial grounds. The need for research and development, a comprehensive set of standards and criteria, a national plan for low-level waste management, and perpetual care funding are closely related to the central issue and also discussed.

Five of the six commercial burial grounds are regulated by Agreement States; the sixth is regulated solely by the NRC (NRC also regulates Special Nuclear Material at the sites). The sites are operated commercially. The operators contribute to the perpetual care funds for the sites at varying rates. The States have commitments for the perpetual care of the decommissioned sites except for one site, located on Federally owned land.

The States, through their regulatory programs have adequately protected the public health and safety. However, waste disposal is a national problem, and the States have neither the resources nor responsibility to develop and implement a national low-level waste disposal program. The citizens of individual States should not bear the cost of major contingency actions or inadequacies in perpetual care funding for burial sites which serve national rather than State needs.

> Federal control over the disposal of low-level waste should be increased by requiring joint Federal/State site approval, NRC licensing, Federal ownership of the land, and a Federally administered perpetual care program.

Standards, criteria, and regulations for site selection, operation, monitoring, decommissioning, post-operational maintenance and funding requirements need to be either developed or, if existing, need to be improved.

> The NRC should accelerate the development of its regulatory program for the disposal of low-level waste.

Alternatives to shallow land burial of low level wastes need to be evaluated. Criteria to distinguish between waste to be disposed of by shallow land burial (or alternative commercial methods) or sent to a Federal repository need to be developed. There is not now a planning base for insuring adequate disposal capacity without undisciplined site proliferation. However, it is projected that there is adequate capacity in current sites to the year 1990. There is sufficient time to develop a national low-level waste management plan, a regulatory program, and evaluate alternative methods of disposal before additional disposal sites need to be developed.

The undisciplined proliferation of low-level burial sites must be avoided. NRC should evaluate alternative disposal methods, conduct necessary studies, and develop a comprehensive low-level waste regulatory program (i.e., accomplish the above recommendations) prior to the licensing of new disposal sites.

INTRODUCTION

This report is the result of a Nuclear Regulatory Commision (NRC) Task Force study of programs used by the NRC and State governments to regulate disposal of commercial low-level radioactive wastes.[1] The study is part of the NRC re-examination of the technical and regulatory bases for low-level waste management and also covers issues raised by the U.S. General Accounting Office (GAO), the Joint Committee on Atomic Energy (JCAE) and the House Committee on Government Operations.

Following issuance of the January 12, 1976 GAO report to Congress on disposal of low-level waste, the Conservation, Energy, and Natural Resources Subcommittee of the House Committee on Government Operations held hearings on low-level waste during February, March and April. In their report, "Low-Level Nuclear Waste Disposal" (House Report No. 94-1320), the House Government Operations Committee recommended that the Federal government move promptly to develop a coordinated program for the safe management of low-level radioactive waste and consider assertion of Federal control over regulation and ownership of the commercial burial grounds. In testimony before the JCAE given on May 12, 1976 the NRC said that it would reassess the roles of the Federal and State governments in the regulation and operation of the commerical burial grounds.

The Task Force, in the process of studying the issue of Federal versus State regulation of commercial burial grounds, expanded the scope of its study to include other related issues which currently affect commercial burial ground regulation and operation (i.e., the need for research and development, development of a comprehensive set of standards and criteria, development of a national plan for low-level waste disposal, and perpetual care funding). The report reviews these issues, describes the present status of NRC and State regulatory roles in waste management, and presents conclusions and recommendations directed toward improving low-level waste management programs.

There is a large body of information in Atomic Energy Commission (AEC) policy papers, testimony, reports, etc., that collectively describes how the present low-level waste-management program evolved and how the AEC

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[1] For the purposes of this report, low-level radioactive waste includes all waste except that defined as high level waste, spent fuel or mill tailings. Appendix F to 10 CFR Part 50 defines high level radioactive wastes as "those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel."

and the Agreement States[2] performed during this evolution. The evolution involved complex interlocking relationships between several Federal and State agencies, and between these authorities and burial-ground operators. The Task Force has not attempted to reassess the validity of individual licensing actions, inspections, or studies undertaken by individuals or agencies in the past. Instead it attempted to determine where improvements might be made to the program.

Five of the six commercial burial grounds (Beatty, Nevada; Hanford, Washington; Barnwell, South Carolina; Maxey Flats, Kentucky; and West Valley, New York) are located in the Agreements States and are regulated by the States. However, at three sites (Beatty, Hanford and Barnwell), the NRC licenses special nuclear material because the quantities authorized for possession by the commercial operator exceed those which the Agreement States may license under their Agreements. The sixth burial ground (Sheffield, Illinois), located in a Non-Agreement State, is regulated by the NRC although the State licenses and controls activities at the site concerning naturally occurring and accelerator produced radioisotopes which are not subject to NRC control. The sites are all commercially operated. The Nuclear Engineering Company, Inc. operates four of the sites (Hanford, Beatty, Sheffield, and Maxey Flats), Nuclear Fuel Services, Inc. operates the West Valley site and Chem Nuclear Systems, Inc. operates the Barnwell site. All of the burial grounds are on State owned land with the exception of the Hanford site which is on Federally owned land leased to the State of Washington. For all sites the State has commitments for assuring long term care and maintenance of the site although responsibility for the Hanford site will eventually revert to the Federal government.

In developing this report, the Task Force reviewed current events and reports concerning low-level radioactive waste management. These are summarized in Appendix A. The history of the development of low-level waste management is summarized in Appendix B. To obtain first-hand information about current waste-disposal programs as conducted by the States, as well as to obtain their views about regulating commercial burial grounds, the Task Force visited Illinois, Kentucky, Nevada, New York, South Carolina, and Washington State. The Task Force met with senior management representatives from these States, and visited the radioactive waste burial grounds in each State except Washington. Issues reviewed during each State meeting are summarized in Appendix E.

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[2] "Agreement States" are those States which, pursuant to Section 274 of the Atomic Energy Act, have entered into an agreement with the NRC for assumption of regulatory control of byproduct, source and small quantities of special nuclear materials.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion I

The present system for low-level radioactive waste management lacks national organization and direction. The States, in discharging their regulatory duties, have operated under difficult circumstances but have adequately protected the public health and safety. The Task Force can find no compelling health or safety reason for reassertion of Federal control at this time. However, the States do not have the resources to provide the needed overall leadership or oganization, nor do they have the obligation to find solutions to this national problem. The States will continue to have a vested interest in the protection of the health and safety of their citizens and in land use decisions. This vested interest can be satisfied by their participation in the site selection process and their monitoring of day-to-day operations. The development and implementation of a national waste management plan, which includes adequate capacity without site prolifieration, can be more readily achieved if the NRC assumes regulatory control (with State participation). The Federal government should assume responsibility for perpetual care of the sites which can be readily accomplished through Federal landownership.

Recommendation I

The NRC should initiate action in cooperation with appropriate Federal and State agencies to increase Federal control over the disposal of low-level waste by:

a. Requiring

- Joint Federal/State approval of new disposal sites
- NRC licensing, with State participation, of current and new disposal sites
- Federal ownership of land for all disposal sites

b. Establishing a Federally administered perpetual care program.

Conclusion II

There is an urgent need to establish a comprehensive set of standards, criteria, and regulations governing low level waste management. An integration and acceleration of ongoing efforts to establish such a program is required. Emphasis should be placed on:

a. Developing operating, monitoring, decommissioning, post-operational maintenance and funding requirements for both existing and future burial sites.

b. Developing criteria for the acceptability of future proposed shallow land burial sites or alternative disposal methods.

c. Developing criteria for determining which wastes can be disposed of by shallow land burial.

Recommendation II

The NRC, in cooperation with appropriate Federal and State agencies, should accelerate development of the regulatory program for the disposal of low-level waste which includes regulation, standards, and criteria.

Conclusion III

National planning must assure adequate disposal capacity beyond 1990 while preventing an undisciplined proliferation of sites. While there have been other disposal methods used, the only currently practiced method is shallow land burial. Since the enactment of the National Environmental Policy Act (NEPA) a comprehensive Federal examination of alternative disposal methods has not been made. Such an examination is needed.

There is now sufficient burial capacity for the disposal of commercial low-level waste to the year 1990. Until extensive investigation of alternatives to shallow land burial is completed, the additional licensing of new shallow land burial sites should be avoided. That investigation may disclose better methods and practices. The undisciplined proliferation of low-level burial sites must be avoided.

Recommendation III

The NRC should initiate immediately the necessary studies to identify and evaluate the relative safety and impacts of alternative low-level waste disposal methods. No new disposal sites should be licensed until a full examination of alternative disposal methods has been completed or unless an urgent new need is identified. The NRC should assure effective use of existing commercial burial grounds.

DISCUSSION

The Task Force views the essential elements of a satisfactory national low level waste management program as one which provides for (a) adequate disposal capacity at the least environmental and social costs, (b) well defined standards and regulations for site selection, operation, and long term care of disposal sites, and (c) capability of those governmental agencies having responsibility to implement the program.

The following discussion develops issues which are pertinent to the Task Force conclusions and recommendations and to the development of a national low-level waste management program. The issues which follow are not presented in the same order they are covered in the conclusions and recommendations but rather, are presented in a way which leads to the underlying issue of Federal vs. State control.

Waste Projections

A first step in dealing with the problem of exercising positive control over the timing and location of disposal sites is a projection of needed waste disposal capacity on a national and regional basis. Though there are several such projections dealing with wastes expected from the nuclear industry (principally fuel-cycle operations), they vary as to volume of wastes expected and the basic assumptions used in the projections. Further, the projections are based on national rather than regional needs and they differ regarding the types and forms of wastes expected, and they use differing waste classification schemes. Assumptions regarding waste-treatment systems to be used at various fuel-cycle facilities are different, and the number, types, and power levels of reactors generating wastes all differ.

A review of projected waste generation that takes these factors into consideration would place on public display the national requirements for low-level waste management, would enhance the quality of licensing decisions, and would provide a sound basis for future actions. A review of some projections and an analysis of site capacities based on these projections is contained as Appendix D. This preliminary analysis indicates that there is sufficient national capacity to accommodate wastes generated until 1990.

Technical Alternatives to Shallow Land Burial

Development of a sound policy regarding disposal of low-level wastes requires a sound analytical basis for the selection of specific methods among the alternative methods available. Shallow land burial is now conducted essentially as it was in the early days of the nuclear industry,

while the apparent alternatives for disposing of wastes have been dismissed or ignored. For example, although the Energy Research and Development Administration (ERDA) now has a program to advance the technology of shallow land burial, an in-depth study of disposal alternatives has never been conducted. Such an analysis might be regional in character, based on cost and benefits, and should assess the feasibility, technologies, state of the art, safety and environmental risks, and projected capacities of other potential disposal methods.

Several alternatives to shallow land burial are presented in ERDA 76-43[4], but they are not explored in sufficient depth to allow comparisons as to their respective merits. A partial list of alternatives and treatment options includes:

- Placement in deep geologic formations.
- Placement in existing salt mines (or other existing mines).
- Placement in Nevada test-site cavities.
- Disposal on ocean floors.
- Hydrofracture injection of solidifying materials into geologic formations (e.g., grout into shale layers).
- Special treatment (e.g., volume reduction, solidification, incineration, and containerization) at regional processing centers prior to disposal.
- Disposal at generation site, (e.g., nuclear parks).
- Retrievable engineered storage.

Standards and Criteria

Some standards and criteria have been developed for shallow land burial. Initially these were based on AEC experience during operation of its burial grounds. Additional guidelines, which for the most part are site specific, were developed through regulation of the commercial sites. A comprehensive set of standards and criteria based on national requirements covering all aspects of burial ground operation is lacking. Such standards which can withstand technical and public review should be developed.

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[4] Alternatives for Managing Wastes From Reactors And Post-Fission Operations In The LWR Fuel Cycle, Energy Research and Development Administration, May 1976.

The following general requirements, currently in use, were followed by the AEC and Agreement States in licensing existing commerical sites:

- A written commitment must be obtained from a government body or a responsibile official that a State or Federal agency would assume control over the burial site in the event of default or abandonment of the site by the commercial operator. The site must be located on land owned by either the Federal or State government.

- The geological and hydrological characteristics of the site must be such that waste material is contained in a manner that will not endanger public health or safety and that migration of radioactivity from the site is unlikely.

- The waste must be in solid form before burial. Liquid waste must be solidified or immobilized to minimize the potential for migration.

- The burial-ground operator must establish and conduct an environmental monitoring program. To determine whether migration has occurred, operators are required to establish a baseline of radioactivity that existed in the environment before any waste was buried. The monitoring program must be continued by the operator to detect radioactivity increases beyond those original levels. Increases must be reported to the appropriate regulatory agency, which then analyzes the possible significance and develops corrective actions as appropriate.

- The packages in which wastes are transported must comply with appropriate Federal standards. Packaging is designed to provide protection during transportation and handling. Although packaging would provide a primary barrier, it is not relied upon nor expected to provide waste containment after burial. The geology of the site is to be relied upon for containment.

In the past, site selection criteria required that migration of radioactivity from the site be unlikely. In effect, zero releases were expected. As recent water management problems at two of the sites have illustrated, these expectations were not realistic (see Appendix C). Few specific hyrogeology criteria existed until recently upon which potential sites could be evaluated or locations selected, and criteria developed to date are incomplete.

Practices and procedures at the sites vary on such matters as trench construction, waste placement, type and form of waste accepted, monitoring programs, water management, and contingency provisions. Some variations in operational practice among sites are necessary because of individual site characteristics. However, specific criteria for many aspects of site operation have not been developed. For example, criteria require that the site operator conduct an environmental monitoring program, but details on how such a program should be carried out are not well defined. Government policies require that radioactive wastes be solidified before disposal, but standards for evaluating solids, particularly with respect to liquid-waste solidifying agents, have not been developed. Although isotopic migration from burial trenches is not expected, national standards are needed to evaluate the significance of radioactivity migration should it occur and to evaluate proposed corrective action.

The application of criteria by individual States affects site utilization. From a national viewpoint, waste-disposal capacity is dictated both by the number and location of sites and by limitations on the type, form and specific activity of wastes accepted at each site. Some sites accept dewatered resins, whereas others require that such wastes be solidified in concrete or some other suitable solidification agent. One site limits the average activity per package to 1 curie/ft^3.

The safe disposal of radioactive waste requires the availability of safe disposal sites or facilities as well as the development of the standards and criteria for safe disposal. Some States and certain elements of the public are reluctant to accept disposal facilities in their jurisdiction or vicinity. This reluctance may be based on parochial interest as well as genuine concerns about the perceived hazards. If this attitude becomes prevalent, there may not be a mechanism to insure that suitable sites as identified by site selection criteria and environmental and economic analyses are, in fact, made available as they are needed.

Certain operational considerations have not been seriously evaluated. Packaging used for transporting waste does in fact provide a measure of containment for materials with short half-lives, but packaging is not considered to provide any containment for the waste. In evaluating the hydrogeology of the sites, the AEC utilized the expertise of the U.S. Geological Survey and this expertise was also made available to the Agreement States. These evaluations were based on the assumption that wastes buried in shipping containers, for practical purposes, were in direct contact with the earth. Packages should be evaluated as containment barriers.

Only in recent times has consideration been given to the segregation of long-lived material, and no national standards have been implemented in this area. In 1970, the AEC implemented policies limiting the burial of

long-lived transuranium radionuclides at AEC operated sites (transuranium elements are elements having atomic numbers greater than 92 including plutonium). Such waste containing greater than 10 nanocuries per gram were sent to retrievable storage facilities. The AEC issued a proposed rule on September 12, 1974 which would have limited burial of transuranium wastes at commercial sites also. Following creation of the NRC and ERDA, ERDA withdrew the draft environmental statement needed to fulfill requirements of the National Environmental Policy Act (NEPA). Although the rule has not been implemented, all the commercial burial sites except the Hanford site presently limit the burial of transuranium nuclides. Development of a rule and supporting environmental statement is still being pursued by NRC in concert with other reviews such as this one.

Waste treatment and processing, such as incineration and compaction, may be effective in increasing site capacities and decreasing waste mobility, but no standards and little experience are available with which to evaluate these operations insofar as waste management is concerned. In addition, guidance is needed for evaluation of the full range of environmental impacts associated with site operation. For example, acceptable uses of sites after decommissioning have not been determined. Revenue-producing activities following decommissioning could minimize land-use impacts.

State and Federal governments recognize the need for long-term control over land used for waste disposal. Associated with such control are requirements for effective site decommissioning, site care, and further uses of the site. No commercial or major ERDA site has been decommissioned to date. If the New York site is not reopened and if the 10 cents per pound excise tax in Kentucky results in an operator decision to close the site, decommissioning could become a reality in the near future rather than the late 1990's, as was planned when the sites were opened. While the need for decommissioning and long-term care standards is recognized, national standards for these aspects have not been developed.

Licensing of New Shallow Land Burial Sites

The need to investigate alternative methods for the disposal of low-level waste and to develop standards and criteria has been identified. There is an additional need to better define capacity requirements on a regional basis. As Appendix D shows, there is sufficient capacity at the currently licensed sites to accommodate low-level waste until the year 1990. The continued licensing of shallow land burial sites prior to the evaluation of alternative methods of burial and regional planning could result in site proliferation of what may be a less than optimum

disposal method. Until a need to expand capacity or a national low-level waste management program (including the evaluation of alternative methods of disposal) has been established, licensing of additional low-level waste disposal is unlikely to be in the best public interest.

Long Term Care of Disposal Sites

As a matter of policy, the Federal government has never assumed long term responsibility for waste burial sites. The States have assumed ownership and commitment to long-term care of the sites, though responsibility for the Hanford site which is on land leased from the Federal government, will revert to the Federal government. Most States indicate that under present leases, burial-ground operators can abandon sites at any time without a continuing financial obligation for long-term care and maintenance.

In all States except Illinois, where disposal fees are paid into the general State fund, a specific fund has been established for perpetual care of the sites. The money is paid to the State by the operator and is based on per-cubic-foot burial charges, which range from 5¢/ft^3 to 16¢/ft^3. Sites that are closed, as in New York, will accrue no funds for perpetual care while they are shut down.

Available money for perpetual care thus varies from State to State, ranging from $40,000 in Washington to $251,000 in South Carolina. With the possible exception of the South Carolina site, neither the States nor the Task Force believe that funds are being accrued at a rate sufficient to adequately care for the sites.

In a report on Bonding and Perpetual Care of Nuclear Licensed Activities (see Appendix A, Section 12), the National Conference of Radiation Control Program Directors (an organization of State representatives) recommends that annual interest from perpetual care trust funds should total between $50,000 and $250,000, depending on burial ground characteristics. This recommendation ignores devaluation of the dollar, and inflation of equipment, manpower, and technology costs. Even an analysis which includes inflation/deflation factors may ignore changes in other factors such as in profit margin, tax structure, and availability of monies. In a recent analysis of South Carolina site needs (see Appendix A, Section 12), Clemson University considered some of these factors and recommended a 14¢ per cubic foot charge to provide an adequate fund by 1995. Still, it is difficult to access accurately what charge would be required to establish a perpetual maintenance fund.

Initially, the funds were established to provide money from interest for perpetual care of the sites. They were not considered as resources for corrective action, since major problems in site operations were not expected. However, with recent operational problems at several sites, the states have reevaluated use of the funds. It is evident that presents funds are insufficient for major corrective actions. Furthermore, such use of the funds would deplete the principal, leaving little money for long-term care. All States indicated that they would need Federal financial and technical assistance if major deficiencies in site performance are found.

Some States have considered requiring bonds to assist in funding programs, but have found that these are not generally available for burial grounds except at high cost. It was suggested by the State of South Carolina, in testimony before the House Government Operations Committee, that an indemnification program similar to the Price-Anderson structure for nuclear facilities be developed for burial grounds.

No national standards are available by which States can evaluate the adequacy of existing perpetual-care funds or collection rates, evaluate proposed changes to perpetual-care charges, or evaluate amounts that might be needed for corrective actions if major problems develop in site operation. These standards should be developed.

The States have expressed the view that waste originators and site operators, not State citizens, should bear the cost of licensing, inspection, monitoring, and long-term care. At all sites except the one in Illinois, over half of the waste comes from out of state. In Nevada and Kentucky, only about 1% of the wastes buried are generated within the States. At the Sheffield, Illinois site, about 70% is generated in-State. Six States are providing a waste disposal capability for the nation and thus, have assumed liability for wastes generated nationally.

Federal Vs. State Regulatory Control

The underlying issue of this report is whether the NRC should exercise exclusive licensing and regulatory authority over commercial low-level waste management, or whether this authority should be shared with the States. Five of the six burial sites are licensed and regulated by States under an agreement with the NRC pursuant to section 274 of the Atomic Energy Act. Notwithstanding this delegation of authority, the NRC has a responsibility for assuring that the States conduct regulatory programs which are adequate to protect public health and safety. 10 CFR Part 150, which implements certain provisions of section 274,

permits Federal reassertion of regulatory control over burial grounds. However, Part 150 requires that reassertion be based on a need to protect the public health and safety from nuclear waste hazards.

The NRC regularly reviews the Agreement State programs and has found their licensing and regulatory activities to be adequate to protect the public health and safety and compatible with the NRC regulatory program. The reviews include an independent assessment of licensing, inspection and monitoring activities involving the burial grounds. In addition, the NRC has conducted some special studies and investigations at the sites. For example, the NRC has conducted an independent assessment of the Maxey Flats site, participated in assessment of pilferage at the Nevada site, conducted precautionary inspections to check for further incidence of pilferage and has collected and analyzed independent environmental samples at all sites. In reviewing information about these routine reviews and special studies the Task Force found no evidence that the public health and safety is not being adequately protected (see Appendix C).

The JCAE has expressed concern that the NRC may not have adequate control over the activities of Agreement States in the management of low-level waste. However, the JCAE has not taken a specific position that the NRC should reassert regulatory jurisdiction over all burial grounds. The House Government Operations Committee in its June 30, 1976, report recommends that licensing and regulatory authority over low-level waste management be exercised by the NRC rather than the States. We conclude from our reading of that report that this recommendation is based not so much on a judgement by the Committee that the States are not doing an adequate job, as that low-level waste management is a national problem, requiring centralized control for standards development, environmental assessment, licensing, decommissioning, and long-term care and maintenance.

The States, on the other hand, believe they have an important role in the licensing of burial grounds within their own borders since they have traditional responsibility for assuring the health and safety of their citizens. They believe that they can fulfil this responsibility by participating in burial ground site selection, defining safety provisions for site operation, and inspections during operation, decommissioning, and long-term surveillance. Opinions among State officials vary as to how the State should fulfill its responsibility. These range from the view that State goals could best be accomplished through State licensing, inspection and monitoring under section 274 Agreements to views that the States could participate with NRC in a cooperative arrangement to accomplish their goals while NRC retains regulatory jurisdiction over the sites (see Appendix E).

The GAO, the House Government Operations Committee, and the States all appear to be in agreement that the NRC should take the lead in developing national standards necessary to put low-level waste management on a firm regulatory basis. The NRC has in the past assumed this role in the development of radioisotope licensing criteria for its own program as well as for the Agreement State program. The Task Force believes that NRC responsibility for development of nationally applicable standards is beyond dispute.

An issue associated with Federal/State regulatory control over burial grounds is the undisciplined proliferation of burial sites. Federal and State regulatory authority, and to a degree the State's authority as landlords for the sites, has been expressed to date chiefly as a veto power. Sites were evaluated on their individual radiation-safety merits, and licenses were issued or denied on that basis. Siting and location were based mainly on initiatives by private operators. In most instances, little consideration was given during licensing reviews to the actual need for a burial ground in a specific region and at a specific time. In some cases, siting was promoted by a State to provide capabilities chiefly or exclusively for the State's nuclear industry (see Appendix E). With the advent of NEPA the NRC is required to use a cost/benefit analysis as a mechanism to consider the need for sites licensed by the NRC and to consider alternative licensing decisions. The States, under the terms of their agreements, are not required to comply with NEPA, but in 1974, the AEC sent a letter to Agreement States requesting that the national need for burial grounds be considered to minimize environmental impacts and to control site proliferation. The States have honored this request. New Mexico has agreed to take these considerations into account during current discussions with a burial-ground operator for opening a site within that State. It is impossible to predict how well or how long this spirit of cooperation will continue without specific commitments from the States to account for costs and benefits--on a national scale--in licensing actions.

The Task Force can find no compelling health or safety reason for reassertion of Federal control at this time. However, there is an urgent need for a comprehensive commercial low-level waste management plan. For coherent implementation of this plan the Federal government must assert leadership and control. The States will continue to have a vested interest in the protection of the health and safety of their citizens. This vested interest can be satisfied by their participation in the site selection process and their monitoring of day-to-day operations. The fulfillment of a national waste management plan, including having adequate capacity without site proliferation is more readily achieved if the NRC performs the licensing (with State monitoring). Also, it appears desirable and equitable for the Federal government to assume responsibility for long-term care of the sites since the States generally do not have the resources to assure adequate care under a variety of contingencies, and the sites generally serve regional rather than State needs. This can be accomplished by the Federal government ownership of the land and administration of the perpetual care program.

Appendix A
OVERVIEW OF REPORTS AND CURRENT EVENTS

A wide range of congressional, technical, industrial, public and governmental groups are giving serious attention to the disposal of low-level radioactive wastes by shallow land burial. The sections which follow are intended to provide an overview of the activities and concerns of many of these groups. Several of the sections include or consist entirely of summaries of major documents published by the groups.

Section		Group
1	-	General Accounting Office (GAO)
2	-	House Committee on Government Operations
3	-	Joint Committee on Atomic Energy
4	-	National Academy of Sciences
5	-	MIT Energy Laboratory (Willrich Report)
6	-	Atomic Industrial Forum/NUS Corporation
7	-	Natural Resources Defense Council (NRDC)
8	-	Federal Energy Resources Council (ERC)
9	-	Energy Research and Development Administration (ERDA)
10	-	United States Geological Survey (USGS)
11	-	Environmental Protection Agency (EPA)
12	-	States
13	-	Nuclear Regulation Commission (NRC)

1. General Accounting Office (GAO)

In June 1974, the GAO initiated a review of waste burial grounds. On January 12, 1976, the GAO issued a report to Congress. The report dealt with both commerical burial activities and the burial practices of Energy Research and Development Administration operated facilities. Several recommendations were directed to the NRC. The most broad ranging GAO recommendation was for studies to evaluate the ability of existing commercial and ERDA sites to retain radioactive waste. On the basis of these studies, site selection criteria for determining the long-term suitability of existing disposal sites and for selecting future sites would be developed.

The following table summarizes the GAO recommendations and proposed NRC action as outlined in NRC's response to the Comptroller General dated April 2, 1976.

Shallow Land Burial

GAO Recommendations/Proposed NRC Actions

1A. RECOMMENDATION: Sponsor Interagency Comprehensive Study of Existing Sites
ACTION: Interagency Group to Coordinate; Sample Analytical Aid to USGS; Brookhaven Study on Properties of Wastes

1B. RECOMMENDATION: Develop Site Selection Criteria
ACTION: Develop Based on 1A

2. RECOMMENDATION: Develop Environmental Standards For Radioactive Releases From Sites
ACTION: Develop Based on 1A

3. RECOMMENDATION: Evaluate Existing Environmental Monitoring Programs
ACTION: Effect as Part of 1A

4. RECOMMENDATION: Follow up on Kentucky Actions re Correction of Maxey Flats Water Problem
ACTION: Continued Review of Kentucky Program and Independent NRC Sampling

5. RECOMMENDATION: Resolve Pending License Renewals
ACTION: Review NRC Applications; Work With States

6. RECOMMENDATION: Establish Environmental Monitoring Data Exchange
ACTION: Set up exchange program

7. RECOMMENDATION: Establish Independent NRC Environmental Monitoring Program
ACTION: NRC Collects and Analyzes Environmental Samples for Confirtory Measurements

8. RECOMMENDATION: Study Ways to Improve Record-Keeping at Sites
ACTION: Support State Task Force Efforts

9. RECOMMENDATION: Establish Long-Term Care Criteria and Adequate Funding
ACTION: Participate in State Task Force Efforts

10. RECOMMENDATION: Develop Policy on Federal Role in Migration Problems
ACTION: Work With ERDA to Establish

2. House Committee on Government Operations
Low-Level Nuclear Waste Disposal

As a result of the January 12, 1976 GAO report, congressional hearings were held during February, March, and April 1976 by the Conservation, Energy and Natural Resources Subcommitt . the House Committee on Government Operations. Representatives om the U.S. General Accounting Office, Environmental Protection Agency, U.S. Geological Survey, Nuclear Regulatory Commission, Energy Research and Development Administration, the Nuclear Engineering Company, and the States of Illinois, South Carolina and Nevada presented testimony before the Committee.

In House Report No. 94-1320, dated June 30, 1976 the Committee on Government Operations found that management and regulatory responsibilities for low-level radioactive waste disposal are dispersed throughout the Federal and State governments and are without consistent direction and coordination. In addition, it found that the performance of existing disposal systems "is not uniformly good" and radioactive waste migration has occurred. The Committee proposes seven recommendations: (1) all affected Federal organizations should take steps "to establish the safest possible containment systems for all low-level radioactive wastes, including detection standards for determining when migration has reached unacceptable public health and safety levels"; (2) State-Federal authorities and programs concerning site operation and financial and technical assistance should be clarified and a comprehensive policy developed; (3) agreements between Federal organizations setting forth their respective duties should be entered into; (4) agencies should collect data on radioactive wastes already disposed and projected to be disposed; (5) Congress and the executive branch should consider legislation which would, (a) "reassert Federal jurisdiction and the regulatory authority" of the NRC "over commercial land burial sites," and (b) assign title to commercial facilities and leases governing the sites to ERDA; (6) USGS should take action to assure adequate hydrogeologic and hydrochemical data for evaluation of existing and future burial sites; and (7) EPA should provide adequate technical assistance to State governments consistent with its radiation control program in monitoring and security of burial sties.

3. Joint Committee on Atomic Energy

Shallow land burial programs were discussed during Radioactive Waste Management Hearings before the Subcommittee on Environment and Safety of the Joint Committee on Atomic Energy held May 10-12, 1976. These Hearings were held primarily to coincide with the release of ERDA-76-43, "Alternatives for Managing Waste from Reactors and Post-Positions Operations in the LWR Fuel Cycle." Representatives of the Energy Resources Council,

ERDA, National Academy of Sciences, Allied General Nuclear Services (AGNS), USGS, EPA, NRC, and Pacific Northwest Laboratories participated in the hearings. The prepared testimony by a number of the agencies concerning shallow land burial focused on on-going programs and tentative schedules.

On May 12 during the NRC segment of the proceedings, the Joint Committee questioned whether NRC has adequate control over the activities of the Agreement States in the management of low-level wastes or whether modification or revocation of agreements is needed to assure adequate control. Existing reviews and assistance measures directed toward State programs were reviewed. NRC staff attributed none of the current problems at the sites to limitations on its statutory authority.

NRC staff described plans to review the Federal/State roles and report to the Committee. The Committee emphasized the need for timely resolution of studies and action on the Federal/State responsibility issue to assure continued protection of the public health and safety.

4. National Academy of Sciences

"The Shallow Land Burial of Low-Level Radioactivity Contaminated Solid Waste," prepared by the Panel on Land Burial, Committee on Radioactive Waste Management, Commission on Natural Resources, National Research Council of the National Academy of Sciences, was approved for publication on August 25, 1976.

The report is the result of a study begun in 1973 of the problems associated with shallow land burial of low-level ERDA wastes. (The observations and recommendations are considered valid for the commercial sites as well.) The focus was on the technical and scientific issues, not political, social, and economic issues.

The Panel found that no measurable harm to human health has resulted from operation of ERDA sites, that volume reduction by treatment and segregation at the point of origin is essential, that risk/benefit analysis should precede any further exhumation of TRU wastes, and that recovery of useful materials should be studied. Other findings included concern for planning for wastes from decommissioning of power reactors and concern for the adequacy of existing capacities, site selection criteria, current migration studies and efforts to educate and inform

the public. The Panel believes that a final repository for TRU wastes and futher study of the 10 nanocurie/gram criterion are needed as soon as possible.

A number of general principles for burial are recommended. Needs such as adequate monitoring and contingency plans are acknowledged. Recommendations are made concerning the needs for early warnings that the environment surrounding a site could change and realistic cost-analysis of waste management controls.

The report includes an analysis of potential hazards for all management aspects including exhumation, a review of possible future problems and solutions including volume reduction techniques, a review of detection capabilities for transuranic nuclides in waste, and site selection considerations. Appendixes with detailed information on various ERDA facilities are also included.

5. MIT Energy Laboratory
"Radioactive Waste Management and Regulation"
Report to the U.S.E.R.D.A. (Willrich Report)

This report was prepared between June 1 and September 1, 1976, by Mason Willrich, a Professor of Law at the University of Virginia (on leave). He was assisted by 3 law students and a nuclear engineering student. The project was conducted under the auspices of the Energy Laboratory at the Massachusetts Institute of Technology for the U.S. Energy Research and Development Administration. The following summary is based on a draft copy dated September 1. The final report on the project was not available when the document was reviewed.

The project reviewed the current status of many aspects of waste management and regulation, and accomplished an extensive review of the literature. Based on this review the report philosphizes about the best methods for accomplishing waste management objectives. The authors make many sweeping recommendations of major changes in the organization and administration of the overall waste management program.

The main focus of the report is on high level wastes. Brief mention is made of transuranic contamination wastes and waste classification.

The conclusions of the report are: (1) safe management of post-fission radioactive waste is a present necessity and an irreversible long-term commitment, (2) the basic goals of U.S. radioactive waste policy are unclear, (3) the existing organization for radioactive waste management will be unworkable if left unchanged, and (4) the existing framework for radioactive waste regulations will be ineffective if left unchanged.

Numerous recommendations were made including: a federally chartered public corporation should be established to manage all high level and TRU wastes; with NRC as the primary agency, a comprehensive regulatory framework should be established to assure the safety of all radioactive waste management operations; and the technological criteria for U.S. radioactive waste policy should be clarified and the applicability of such criteria to various categories of waste burial should be established.

6. Atomic Industrial Forum/NUS Corporation National Environmental Studies Project Low-Level Waste Handling & Disposal Alternatives A Study of Nuclear Fuel Cycle Radioactive Solid Waste Management

NUS Corporation was commissioned in 1975 by the Atomic Industrial Forum to perform a study to identify the types and quantities of solid radioactive wastes for each portion of the nuclear fuel cycle. Major conclusions and recommendations were developed in three areas: (1) available land burial space, (2) light water reactors, and (3) fuel fabrication and reprocessing facilities. The following summary is based on review of a draft copy dated March 1976. The final report on the study was not available when the document was reviewed.

The study concludes that existing burial sites will be filled by 1990, that possibly as early as 1980 waste volume will exceed handling capabilities, and that as eastern sites fill up radioactive wastes generated in the east will have to be shipped long distances to western sites. NUS recommends that: (1) additional land burial sites be identified and operational by 1985, (2) land efficiency be increased by deepening trenches, (3) ERDA develop mechanized waste package handling systems, (4) IAEA "Regulations for the Safe Transport of Radioactive Materials" be adopted which would allow for transportation and burial of material with more curies per unit volume; and (5) ERDA evaluate alternative disposal methods and sites.

In regard to light water reactors, (LWR) the study concludes that LWR's will generate 89% of the total volume of wastes through 1990 and that 95% of the waste shipped from LWR's is low specific activity waste. Waste volume could be reduced by a factor of 2.5 using currently available, economically feasible reduction processes and by a factor of 8 if economic feasibility were not considered. The Study recommends that a comprehensive program be undertaken to minimize volumes of waste, that economic alternatives to present radioactive wastes reduction methods be developed and that onsite storage and disposal of LWR waste be considered.

Only 1% of the cumulative waste buried in commercial sites will come from fuel fabrication and reprocessing facilities, according to the

Study. The majority of waste generated will be shipped to Federal repositories due to the waste's high activity levels and transuranic content. NUS recommends that standards and methods be developed by ERDA and NRC in packaging, measuring and disposing of transuranic wastes.

7. National Resources Defense Council (NRDC)

The NRDC is an non-profit corporation with a "nationwide membership of persons dedicated to the defense and preservation of the human environment and the natural resources of the United States." In pursuit of its objectives, the NRDC has been involved in many proceedings involving the AEC and the NRC. On August 9, 1976 NRDC filed a petition for interim rulemaking and preparation of a programmatic environmental impact statement as part of a full-scale evaluation of the Commission's entire low-level waste management program. The scope and content of such a statement was proposed.

Contained within the statement were proposed regulations concerning: (1) a program for prohibiting burial of transuranic wastes at shallow land burial sites, (2) suspension of licensing actions for the sites until national standards are in place, (3) minimum fees for long-term care, and (4) solidification of all wastes before shipment. Specific wording and supporting rationale were submitted.

NRDC feels that "severe problems and uncertainties" in present methods of low-level waste disposal provide sufficient basis for the requests. Some of the items identified are:

- Published reports of radionuclide migration from sites;
- Deficiencies in initial site evaluations and environmental monitoring programs, lax regulatory controls, one case of vandalism, and inadequate plans and funds for long-term care;
- Lack of standards and criteria;
- Failure to adopt the September 1974 rule prohibiting burial of transuranic contaminated wastes even though ERDA continues to prohibit such burial at ERDA sites; and
- NRC and ERDA agreement with GAO recommendations concerning needed improvements.

8. Federal Energy Resources Council
"Management of Commercial Radioactive Nuclear Wastes"
May 10, 1976

This report reviews briefly the nature of radioactive wastes and the public safety aspects of present waste management technology. It focuses on high level wastes although it also discusses the current technology for disposal of low-level wastes (basing its discussion on ERDA's technical alternatives document summarized below). The report finds shallow land burial of solid low-level wastes acceptable and that Federal effort is underway to improve site selection, management procedures and regulations to assure safety.

The report includes a timetable of major events. Those affecting low-level waste management include: 1976-EPA/NRC/USGS will evaluate commercial low-level waste land burial sites and will determine wastes to be consigned. 1977-ERDA will issue a generic environmental impact statement on management of commercial wastes. 1978-NRC will develop standards for long-term care of burial sites. 1979-NRC will estabish site selection standards for new burial grounds.

9. Energy Research and Development Administration (ERDA)

Hearings were held May 10-12, 1976, before the Subcommittee on Environment and Safety of the Joint Committee on Atomic Energy. These Hearings were held primarily to coincide with the release of the ERDA technical alternatives document (ERDA-76-43), "Alternatives for Managing Waste from Reactors and Post-Fission Operations in the LWR Fuel Cycle." (Representatives of the Energy Resources Council, ERDA, National Academy of Sciences, Allied General Nuclear Services (AGNS), USGS, EPA, NRC and Pacific Northwest Laboratories participated in the Hearings.) One purpose of the alternatives document is to provide input to a generic environmental impact statement (which ERDA is preparing) on commercial fuel cycle wastes.

ERDA-76-43 describes alternative technologies for managing all radioactive wastes from the "back end" of the commercial LWR fuel cycle. It is not a "decision or program document." The five volumes contain technical decriptions of waste types, projections of waste generation, the alternative technologies for treatment, interim storage, transportation, final storage and disposal of wastes, and the status of available technologies. Extensive bibliographies are included.

In Volume 4 "Alternatives for Waste Isolation and Disposal" shallow land burial is presented as a viable dispoal mode for wastes other than high level and transuranic wastes. Background information on commercial and

ERDA burial grounds and their operation is presented. The performance of the sites is reviewed and potential modifications to improve the performance and reduce hazards are discussed. The relative merits of eight physiographic regions encompassing the continental U.S. are presented. The possibilities for offsetting deficiencies in the natural containment through various combinations of waste type and form and site engineering are reviewed.

Although sea disposal is mentioned and dismissed, alternative methods for disposing of low-level wastes are discussed as improvements to shallow land burial.

ERDA has also established a Steering Committee on Land Burial to establish "The ERDA Plan to Develop a Technology for the Shallow Land Burial of Solid Low-Level Radioactive Wastes." The first edition of the ERDA plan was released in June 1976. The document outlined a comprehensive program through 1981 to develop techniques for shallow land disposal such that risks will be minimized and the resultant hazard to man will be reduced to acceptable levels. The technology is intended to specify compatible combinations of site characterisitics, waste treatment requirements, site operating practices, and long-term stabilization techniques. Cost estimates and cost/benefit analyses are also planned.

In a summary of FY 1977 implementation of the ERDA plan, studies at five major laboratories are described. The studies include controlled migration studies, computer modeling modifications, development of arid environment site selection criteria and practices, and investigation of unsaturated zone monitoring techniques.

ERDA contracted with Dames & Moore to develop a generic hydrogeologic monitoring program for ERDA burial grounds. A final report, "Development of Monitoring Programs for ERDA Owned Radioactive Low-Level Waste Burial Sites," was issued July 1976. A decision tree method was developed and used to evaluate existing site data and data needs. Generic hydrogeologic models for saturated and unsaturated zones were developed but current data quality allows only partial use and empirical solutions. Applicable criteria were assumed and stepwise development of monitoring programs outlined. These methods were then applied to specific ERDA sites. Further studies are planned to enable cost/effective judgments for balancing monitoring programs and aquisition of additional data.

10. United States Geological Survey (USGS)

The USGS is conducting a long range (5-year) independent study to develop geologic and hydrologic criteria for evaluating waste burial sites and to develop predictive waste transport models for buried wastes. Their

efforts include comprehensive studies of the existing commercial burial sites. USGS has already initiated sampling programs at three burial sites and plans to initiate studies at the remaining sites in the near future. (NRC is assisting USGS in this program by providing analytical services for samples obtained by USGS.) Investigations are both theoretical and applied. Laboratory experiments using samples collected at the different burial sites and comprehensive field investigations are being conducted.

A 1974 report (EPA-520/3-74-009) resulting from some of the earlier studies in this USGS effort, was funded by EPA's Office of Radiation Programs. In this report, "Storage of Low-Level Radioactive Wastes in the Ground: Hydrogeologic and Hydrochemical Factors," Stavros S. Papadopulos and Isaac J. Winograd review existing hydrogeologic criteria for intermediate and long-term burial sites, define hydrogeologic data needs for site evaluation, and review the status of mathematical modeling techniques. The Maxey Flats site is examined as an example. Conclusions include the advantages of relatively simple hydrogeologic settings, the need for buffer zones geared to ground-water flow, and that shallow land burial is a form of disposal, not storage. Extensive references are given.

11. Environmental Protection Agency (EPA)

EPA has announced plans to develop general performance criteria for low-level waste burial sites. EPA has a responsibility for issuing generally applicable standards for the protection of the environment from all sources of radiation. EPA is conducting several studies either in-house or by contract to investigate various facets of this problem.

The New York State Energy Research and Development Authority and EPA are investigating the radioisotopic makeup of typical LWR generated deionizing resins and evaporator concentrate wastes at two or more existing reactors. EPA is examining the radioactive waste received at commercial burial sites generated by LWR's and supporting fuel cycle facilities. EPA is attempting to develop a basis for projecting the wastes to be sent to the burial site as a function of LWR generating capacity growth. EPA has funded efforts by two (2) State licensing agencies to perform annual inventories of quantities of waste received at the sites. Preliminary results of these studies have been published for inventories for 1962 through 1973. Computor programs have been developed to process and analize site inventory data.

As noted elsewhere, EPA has studies in progress at the New York and Kentucky sites to collect data to serve in part, as a basis for establishing criteria. EPA feels that an important part of their program is

the development of an environmental pathways model for evaluating the impact of a waste burial facility on the environment and then validating or verifying this model by actual field studies. The EPA model, itself, is presently being written and field tested at the West Valley burial facility in cooperation with a number of New York State agencies and the U.S. Geological Survey.

Many of EPA's programs are described in, "Annual EPA Review of Radiation Protection Activities," June 1976.

12. States

The National Conference of Radiation Control Program Directors has established task forces on waste management and bonding. The Radioactive Waste Management task force is currently charged with the responsibility to serve as a liaison between the States and Federal agencies in developing standards, regulations, and guidelines in waste management.

Since its creation in 1972, the Conference's Waste Management task force has submitted reports to the Conference documenting problems and areas of concern to the States in which burial sites are located. Many of the recommendations and observations were reemphasized in the GAO report. For example, inadequate inventory data, the need for specific site selection and perpetual care standards, and the need for field studies of existing sites to determine the extent or potential for radionuclide migration were reported by the task force.

The Conference's Bonding task force has developed general guidelines relating to bonding and perpetual care funds for the commercial waste burial grounds. These guidelines are included as Appendix B of the "Task Force Report on Bonding and Perpetual Care of Nuclear Licensed Activities" dated April 5, 1976. The study was sponsored jointly by the Conference, the NRC, and EPA to investigate options available to States to assure licensee financial responsibility for decontaminating and decommissioning of facilities in the event of default.

The report reviews the classes of users where such protection may be necessary, estimates some costs, and examines existing and needed authority to implement bonding and perpetual care programs. For burial grounds, the recommendations are made that a performance bond be posted, that a perpetual care fund for monitoring and maintaining the decommissioned site be established, and that nuclear liability insurance be required.

The State of South Carolina commissioned a special economic assessment for the Barnwell site. This study entitled, "Economic Analysis of Funding

Arrangements for Maintenance, Surveillance, and Contingency Costs Associated with Burial of Low-Level Radioactive Waste in South Carolina" by Clayton Grant, James Hite, and Heyward G. Shealy evaluated the necessary financing for maintenance and monitoring and made some estimates concerning contingency funding. The State of South Carolina has implemented the study's recommendation concerning the increased fee per cubic foot for waste buried, but has abandoned the recommendation concerning performance bonding primarily because the cost was exorbitant in terms of benefits to be gained. The report was released in December 1974.

13. Nuclear Regulatory Commission (NRC)

Recognizing that priorities needed to be reassigned to meet the growing need for objective waste management goals and effective programs to meet those goals, the NRC has moved to develop an overall waste management program. Initial stages have been completed, tentative regulatory needs have been established, and a program is underway to meet these needs.

The Commission's overall nuclear waste management program is designed to address four major objectives:

1. Provide objective performance goals (technical, social, economic, and environmental) against which nuclear waste management programs and strategies can be evaluated.

2. Provide a framework of regulations, standards, and guides for management of nuclear wastes within which NRC can effectively and efficiently carry out the functions dictated by its responsibility to protect the public health and safety. This framework will have to be supported by a comprehensive series of environmental impact statements.

3. Develop a methodology for implementing its goals and regulations and the data base needed to make effective use of this methodology.

4. Be capable of performing licensing reviews on proposed waste management systems on a timely basis as required to meet its responsibilities.

Waste Management Goals

One of the highest priority items in the Commission's waste management program is the establishment of objectives and goals to guide the direction of subsequent program efforts. To this end, a multidisciplinary Goals Task Force was established to address the many concerns requiring consideration in establishing waste management goals from the many perspectives from which these concerns can be viewed. The concerns addressed by the task force included: the magnitudes and lifetimes of potential hazards;

technologies necessary for management of the wastes; institutions and institutional arrangements required for such management; possible interference with utilization of other resources; forclosure of future options; impact on decisions and/or actions of future generations; time frames for action; distribution of hazards and benefits (geographical and temporal); uncertainties which will remain during decision making; and public involvement in decisionmaking. The goals and objectives are intended to apply to all forms of wastes including low level.

A three day symposium sponsored by several federal agencies was held in Chicago October 27-29, 1976 to explore a varity of technological and non-technological factors affecting nuclear waste management. This symposium, which was a follow-on to the ERDA International Symposium on Nuclear Waste Management held in July 1976, served among other things as a forum for public discussion of the Task Force findings.

Development of Waste Management Regulations

Some key elements in the Commission's regulation development program for waste management presently under development which will impact LLW are:

1. New regulations to deal specifically with the licensing and regulation of waste management facilities and activities. The new regulations will set forth licensing procedures for waste management facilities. Also in preparation is a framework into which subsequent regulations concerned with waste mangement can be placed as they are adopted by the Commission.

2. Criteria which will classify wastes according to the degree of confinement necessary to ensure decay of the wastes to some acceptable low-risk level. A task force will recommend to the Commission waste classification criteria and definitions suited to the regulation of radioactive wastes.

3. Acceptable risk criteria for use in evaluating the effectiveness of proposed waste management handling, transportation, storage, and disposal schemes. The scope of proposed risk studies include:

    a. Study mechanisms for determining what constitutes an acceptable risk to the public and the environment from various radiation applications and especially radioactive waste.

    b. Select an appropriate mechanism and utilize it to determine what constitues an acceptable risk from the management of radioactive wastes produced in the nuclear fuel cycle.

c. Provide a set of acceptable risk guidelines which can serve as the basis for Nuclear Regulatory Commission rule-making procedures for the regulation of nuclear waste management operations in the United States.

Studies Underway

Some studies underway which are directly related to the low level waste program efforts or may have significant impact include:

1. A study, "Properties of Radioactive Wastes and Waste Containers," contracted with Brookhaven National Laboratory. The study is designed to measure waste form and package properties relevant to isolating radionuclides from the environment and to assess the adequacy of current and proposed radioactive waste packages.

   While the scope of this program covers radioactive wastes generated in the nuclear fuel cycle and nuclear industry, the initial phase will concern itself with solidified liquid concentrate and solid wastes generated as byproducts of the liquid radioactive waste treatment systems in boiling water reactors (BWR) and pressurized water reactors (PWR).

   Objectives of the study include review of existing information on waste characteristics, solidification methods, and packaging as well as establishing standard test procedures and determining physical and chemical properties for wastes and containers. The study is intended to provide the technical basis for establishing criteria from which standards and specifications for the storage, transportation, and disposal of radioactive wastes can be made.

2. NRC assistance to USGS in their study of commercial burial sites by providing analytical services for samples obtained by USGS. This study is aimed at determining the processes and underlying principles controlling radioactive waste migration through soil. See Section 10.

3. A study directed at developing comprehensive engineering information on the technical status, safety aspects, and costs associated with the decontamination and decommissioning of nuclear facilities for each major type of fuel cycle facility. This study includes: (1) the characteristics of the plant and site; (2) acceptable decontamination levels; (4) radiation exposures to workers and the general public; (4) a benefit/cost analysis; (5) identification of research and development needs. Results from the study will be used to develop regulations and standards directed toward managing the wastes removed from or remaining within such facilities.

APPENDIX B

HISTORY OF LOW-LEVEL WASTE MANAGEMENT

Starting with the Manhattan Engineering District Program, the AEC generally used three methods for disposal of radioactive waste: dilution and dispersion, shallow land burial, and sea disposal. Disposal of commercial waste generally conformed to practices utilized by the AEC's national laboratories. Sea disposal was phased out over the past decade. Dilution and dispersion through release of effluents are still permitted under existing regulations but with increasing emphasis on maintaining such releases to the environment as low as reasonably achievable, most wastes are presently disposed of by shallow land burial. The following chronology traces some of the important events in the evolution of the current commercial waste management practices.

Chronology of Commercial Waste Disposal Practices

1940's & 1950's	-	Low-level waste disposal by dilution and dispersion, shallow land burial at AEC facilities, or at sea.
January 1960	-	Commission announces that regional land burial sites for commercial low-level waste shall be established on Federal or State owned land and operated by private contractors.
May 1960	-	AEC announces that AEC land burial sites in Idaho Falls, Idaho and Oak Ridge, Tennessee will accept commercial wastes as an interim measure pending designation of commercial waste sites.
June 1960	-	Commission initiates phase out of sea disposal, by placing a moratorium on issuing new sea disposal licenses. Existing licenses for sea burial were allowed to remain in effect.
February 1961	-	AEC establishes regulations to permit commercial operation of low-level burial grounds on Federal or State owned land. Regulations mainly procedural with little technical criteria for site selection, etc.

February 1962	-	AEC initiates Agreement State program which permits Agreement State regulation of commercial burial grounds.
September 1962	-	Commission licenses first commercial land burial site located at Beatty, Nevada.
1962 - 1971	-	Five additional commercial burial sites were licensed by the AEC and Agreement States.
May 1963	-	AEC withdraws interim commercial disposal at AEC sites.
June 1970	-	Last disposal at sea.
September 1974	-	AEC proposes restrictions on burial of transuranic contaminated waste.*

Table B-1 summarizes the present licensing and operational status of the six existing commercial waste burial grounds. Until the early 1970's, no problems were identified in the regulation and operation of the commercial burial grounds. Problems subsequently arose at four sites: Maxey Flats, Kentucky, West Valley, New York, Beatty, Nevada and Sheffield, Illinois. A discussion of those problems and additional background information about the current status of the sites is contained in Appendix C. None of the problems has created a significant public health and safety problem, but they do illustrate the difficulties facing the regulatory agencies. They have resulted in irregularities in operation of certain sites and have highlighted the lack of adequate regional distribution of capacity for disposal of low-level waste.

*In 1970, the AEC implemented policies limiting the burial of long-lived transuranic radionuclides (Transuranic elements are elements having atomic numbers greater than 92 including plutonium) at AEC operated sites. Such waste containing greater than 10 nanocuries per gram were sent to retrievable storage facilities. The AEC issued a proposed rule on September 12, 1974 which would have limited burial of transuranic wastes at commercial sites also. Following creation of the NRC and ERDA, ERDA withdrew the draft environmental statement needed to fulfill NEPA requirements for the rule. Although the rule has not been implemented, all the commercial burial sites except the Hanford site presently limit the burial of transuranium nuclides as noted in Table B-1.

TABLE B-1

Commercial Waste Burial Grounds

Location	Operator	Originally Licensed by (year)	Currently Licensed by	TRU Accepted	Operational Status
Beatty, Nevada	Nuclear Engineering Co., Inc. (NECO)	AEC (1962)	State & NRC*	<10 nanocuries/ gram	SNM license suspended
Maxey Flats, Kentucky	NECO	Kentucky (1962)	State	<10 nanocuries/ gram	Open
West Valley, New York	Nuclear Fuel Services	New York (1963)	State	0.1 gram Pu/ft^3 other elements, yes	Closed
Hanford, Washington	NECO	AEC (1965)	State & NRC*	Yes	Open
Sheffield, Illinois	NECO	AEC (1967)	NRC	<10 nanocuries/ gram	Open
Barnwell, S. Carolina	Chem-Nuclear Systems, Inc.	South Carolina (1971)	State & NRC*	<10 nanocuries/ gram	Open

*NRC licenses only Special Nuclear Material.

Presently, the West Valley site is temporarily closed due to water management considerations. It was voluntarily closed by the site operator in March 1975, after the release from the north end of the burial ground of low levels of radioactivity to a local stream. The Maxey Flats site is virtually unused, currently, due to economic considerations. A 10 cents per pound excise tax was placed on waste received for burial by the Kentucky Legislature. This tax makes the cubic foot charge at the site about three times the charge at other sites. The present Sheffield site is almost full unless new technology can be applied. Continued use of the remaining portion of the 20 acres depends on technical demonstration of a compact and fill method of trench construction. Expansion of the site boundaries depends on the outcome of local rezoning hearings as well as NRC safety and environmental analyses.

With regard to program management, it is clear that today's waste disposal system did not evolve out of any grand scheme to meet national needs. In 1960 the AEC published an announcement that it "has determined that regional disposal sites for permanent disposal of low-level packaged radioactive waste materials shall be established, as needed, on State or Federal Government-owned land." The only positive action directed toward implementation of this policy was issuance of a regulation requiring that disposal take place on Federal or State land. It exercised no positive control over the "establishment as needed" portion of the statement. It is interesting to note that AEC staff studies in the early 1960's indicated that the first regional need for a site would be in the Northeast. However, sites in Nevada and Kentucky were licensed before the one in New York.

Appendix C

BACKGROUND INFORMATION, NRC AND AGREEMENT STATE INSPECTION PROGRAMS, AND REVIEW OF PROBLEMS AT THREE COMMERCIAL BURIAL GROUNDS

Background Information

Six commercial shallow land burial grounds have been licensed for the disposal of low level radioactive wastes. The locations, operators, licensing considerations, and operational status are summarized in Table B-1, Appendix B.

Five of the six commercial burial grounds are located in and regulated by Agreement States (Beatty, Nevada; Hanford, Washington; Barnwell, South Carolina; Maxey Flats, Kentucky; West Valley, New York). At three of the sites, the NRC licenses special nuclear material because of quantities authorized for possession by the commercial operator. The site located in the non-Agreement State (Sheffield, Illinois) is regulated by the NRC, although the State licenses and controls activities concerning naturally occurring and accelerator-produced radioisotopes that are not subject to NRC control. The sites are all commercially operated. The Nuclear Engineering Company, Inc., operates four of the sites (Hanford, Beatty, Sheffield, and Maxey Flats), Nuclear Fuel Services, Inc., operates the West Valley site and Chem Nuclear Systems, Inc., operates the Barnwell site. All of the burial grounds are on State-owned land except the Hanford site which is on Federal land leased to the State of Washington. The States have assumed responsibility for assuring long-term care and maintenance of all sites although responsibility for the Hanford site will eventually revert to the Federal government.

The principal operations at a commercial land burial ground are the receipt, temporary storage, and burial in trenches of packaged radioactive wastes. The packages are normally buried as received, with no processing or repackaging of package contents. However, in some cases, the primary package containing the waste is shipped in a reusable overpack or secondary container which may be required by Department of Transportation regulations for shipment of the particular materials involved.

An average burial trench at a commercial burial site is about 300 feet long, 40 feet wide, and 25 feet deep and has a volume of about 340,000

cubic feet. The volume is not completely utilized since there are voids between packages, and between packages and the earth-fill. (It is estimated that about 50% of the volume is utilized.)

Currently, about 2.5 million cubic feet of wastes are buried each year. The approximate cumulative totals of wastes buried through the end of 1975 are shown in Table C-1.

Table C-1

CUMULATIVE TOTAL VOLUME AND QUANTITIES OF COMMERCIAL WASTE BURIED THROUGH 1975

Volume (ft^3)	13,100,000
Byproduct Material (curies)	3,300,000
Source Material (kg)	680,000
Special Nuclear Material (kg)	1,056
Plutonium (kg)	113

NRC and Agreement State Inspection Program

NRC and Agreement State licensing and inspection programs address site operation and performance in both routine and special cases. NRC and State staffs conduct routine inspections and independent confirmatory measurement programs to assure that operations are being conducted safely and in accordance with licenses and applicable regulations. After learning of the Maxey Flats problem, NRC staff collected and evaluated environmental samples at the remaining sites during November and December 1974. Additional samples were taken at each of the sites during February 1976. The results of the NRC independent samples agreed with licensee and State analytical results and showed no evidence of significant transport of radioactivity through migration. NRC staff also found that the licensees and States had initiated environmental monitoring programs which considered the major pathways of exposure to the public. In addition, as a precautionary measure following discovery of pilfering at the Nevada site, special inspections and surveys at other sites were conducted to rule out similar occurrences.

Agreement State regulatory programs for burial sites receive annual attention from NRC staff during evaluation of the programs' compatibility with the Commission's regulations and provisions for the protection of public health and safety. Review meetings involve detailed discussions

of each State's regulatory program and procedures. Waste burial ground license and inspection files are reviewed approximately every two years, or more frequently if unusual problems are being experienced in operation of a site. Routine site visits are conducted about every three years; more frequently if problems are experienced. During each review, the environmental surveillance program conducted at the site by the State and the operator, any ongoing special site studies, changes in perpetual care funding, major changes in the license, operational problems, and contingency actions are discussed. During the site visits, the general site operations, the burial procedures being used, and the onsite and offsite environmental surveillance activities are reviewed. During 1976, NRC visited all sites, except the Kentucky site. The Maxey Flats site was visited as part of a special NRC independent study in 1975.

Review of Occurrences at Kentucky, New York, and Nevada

Kentucky - In the early 1970's, Kentucky became concerned about the accumulation of water in completed trenches at the Maxey Flats Burial Ground and the increase in the volume and quantity of waste being received at the site for burial. Kentucky required the Maxey Flats site operator (the Nuclear Engineering Company, Inc.-NECO) to institute a water management program at the site which included pumping water from trenches to above-ground storage tanks and installing an evaporator to concentrate the pumped liquids for disposal as solids.

In October 1974, Kentucky informed the NRC of the results of their special six month environmental study at Maxey Flats. The study, published in December 1974, concluded that the burial ground was contributing radioactivity to the local environment, but at levels which did not present a public health hazard. They identified tritium, cobalt-60, strontium-89 and 90, cesium-134 and 137 and plutonium-238 and 239 in individual samples in the unrestricted environment. The levels ranged from slightly above background to orders of magnitude above background for certain individual samples. Kentucky recommended further studies at the site to assess the long range health and safety significance of their findings.

Kentucky expanded their Radioactive Waste Disposal Environmental Study Design Committee to include members from other Kentucky and Federal agencies and held a meeting in February 1975. The NRC participated. The Committee recommended a six point program for further studies at the Maxey Flats site. The studies included a deep geology study, a weathered

zone study, and an environmental-biological exposure pathway study. The Committee estimated that the cost for completion of all studies would exceed one million dollars.

On April 30, 1975, The Governor of Kentucky, Julian M. Carroll, requested the NRC to independently assess conditions at the Maxey Flats site and to provide him with findings and recommendations. An NRC review group was appointed and reviewed information about the site, conducted a site visit and met with Kentucky and NECO officials. The NRC concluded, on the basis of their study, that there is no significant public health problem associated with the release of radioactive material from the burial ground and that Kentucky has taken appropriate action to implement the recommendations made in their December 1974 report. The NRC also made several recommendations concerning methods to improve the water management program and to minimize the potential for migration of radioactivity. Governor Carroll was informed of the results of the NRC review in July 1975. He subsequently issued a press release indicating the NRC was responsive to his request and directed the Kentucky Department for Human Resources to carry out the NRC's recommendations. Kentucky has taken action to carry out the NRC's recommendations and has continued an extensive environmental monitoring program. Several USGS research studies are currently under way at the site.

An EPA press release in January 1976 focused a great deal of public attention on shallow land burial grounds. The press release concerned an EPA report which presented environmental data developed during Kentucky's six (6) month study, described various potential migration pathways and drew conclusions from EPA's analysis of the Kentucky data. The EPA report was reviewed by the NRC and comments provided to EPA. NRC commented that the report failed to give adequate attention to the public health and safety significance of the data and that the paper was preliminary in nature since it presented several conclusions concerning pathways for migration of plutonium based on data which the author conceded equally supported other possibilities.

The Kentucky Legislature has imposed a 10 cents per pound excise tax on waste received at the site for burial, effective in June 1976. The tax is intended to assure that adequate funds for any contingency are available. Prices at other sites are determined primarily on a cubic foot basis and range from $\$1.25/ft^3$ to $\$3.25/ft^3$ for most categories of waste. The additional tax in Kentucky results in a disposal cost that is 3 or 4 times higher than the charges at other sites.

Nevada - In March 1976, the Nevada State Department of Human Resources initiated an investigation at the Beatty, Nevada burial ground following a report by the Nuclear Engineering Company, Inc., the Beatty burial ground operator. NECO had reported to the State that a cement mixer used at the burial ground to solidify low-level liquid radioactive waste had been used in the town of Beatty to pour concrete slabs at a local saloon and other private properties. During the course of the State's investigation concerning the use of the cement mixer, the State uncovered evidence that other violations of the company's license had occurred over a period of several years involving removal of contaminated tools, equipment, and supplies from the Beatty site by NECO employees. The State reported its evidence to the NRC and the State suspended NECO's license to operate the burial ground on March 8, 1976, and the NRC suspended NECO's license on March 11, 1976.

A Federal/State investigation which was subsequently conducted at Beatty revealed that the contaminated equipment, tools, and material had been removed from the site to the town of Beatty by NECO employees. No evidence was found that any member of the public received a significant radiation exposure and contaminated material that was identified during the survey was turned in by citizens and returned to the NECO site.

Subsequently, on May 25, 1976, the Nevada Department of Health and Welfare lifted the order suspending NECO's State license authorizing operation of the Beatty burial ground. The order Nevada issued suspending NECO's license was based on emergency conditions existing in the vicinity of the burial ground and permitted immediate action to be taken to eliminate any hazard to the public health and safety due to the removal of potentially contaminated items from the burial ground. The order was lifted by the State on the basis that the emergency conditions had abated and that there was no significant hazard to the public health and safety at and in the vicinity of the disposal site. The NRC has not taken action to reinstate its license to NECO to dispose of special nuclear material at the Beatty site and will not act until completion of the Department of Justice investigation.

New York - In March 1975, the NRC was informed of a water seepage problem at the West Valley, New York burial ground. The State had noted increased levels of tritium in water samples taken from onsite monitoring stations. The source was traced to water seeping out of the caps of two trenches. The flow was estimated to be approximately 1 gallon per day. The seepage resulted from the compaction of waste in the trench and the filling up of the trench with water and subsequent seepage through the low end of the trench. The site operator,

Nuclear Fuel Services, Inc., (NFS) diverted seepage to a holding lagoon. No significant increase in radioactivity in the unrestricted environment was detected.

A meeting of Federal, State and NFS representatives was held at the site on March 11, 1975. Based on discussions between NFS and State representatives, NFS dispatched a letter informing their customers that they were suspending operation until the requirements for operation of the site were known and agreed to by the State.

NFS requested and obtained approval from the State to pump liquids from the trenches to a holding lagoon. The liquids are subsequently processed through the reprocessing plants' low level waste treatment system and released. NFS and State representatives held several meetings since March 1975 to reach agreement on the conditions for reopening and operating the site. Several studies being conducted by the State, EPA and USGS are also under way at the site. As of December 1976, no agreement has been reached and the site remains closed.

Appendix D

WASTE VOLUME PROJECTIONS AND ESTIMATED SITE CAPACITIES

Projections

Several projections for expected generation of non-TRU wastes from 1975 through the year 2000 have been made. In Figure D-1, estimates from (1) an EPA publication* are shown as curve A, (2) ERDA-76-43, as curve B,** and (3) GESMO*** by a Δ. The EPA projections include both fuel cycle and non-fuel cycle non-TRU wastes. The GESMO estimates for the year 2000 for total fuel cycle non-TRU wastes range from 4.2 to 4.3 million cubic meters, depending on recycle mode. No interim values are given. The non-fuel cycle generation shown as curve C are staff estimates based on the following generation rates:

Estimated
Non-Fuel Cycle
Medical/Industrial/Academic

Year	Generation Rate (10^6 Cubic Feet)
1975-80	1
1981-85	1 1/2
1986-90	2
1991-95	2 1/2
1996-2000	3

These estimates are added to the ERDA projection resulting in curve B + C for all wastes. Thus curves A and B + C represent high and low estimates, respectively of waste generation during 1975-2000.

Capacities

Estimates of remaining capacity of existing commercial burial grounds are based on recent discussions with State officials and site operators.

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* "A Summary of Low-Level Radioactive Wastes Buried at Commercial Sites Between 1962-1973, with Projections to the Year 2000," Radiation Data and Reports, Vol. 15, No. 12, December 1974 by M. F. O'Connell and W. F. Holcomb.

** "Alternatives for Managing Wastes from Reactor and Post-Fission Operation in the LWR Fuel Cycle," ERDA 76-43 Volume 4.

*** Final Generic Environmental Statement on the Use of Recycle Plutonium in Mixed Oxide Fuel in Light Water Cooled Reactors, NUREG-0002, Volume 3.

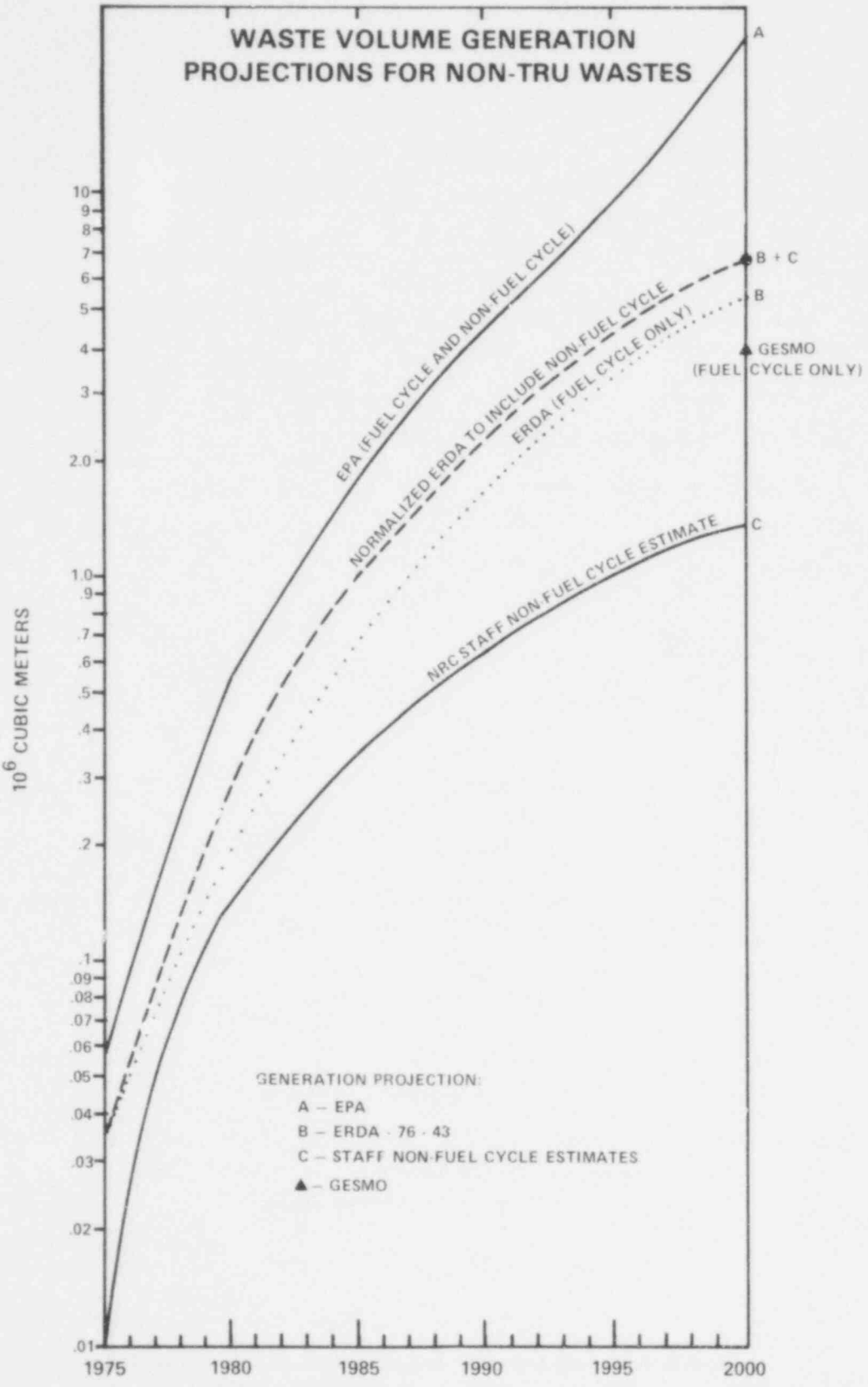


Figure D-1 Waste Volume Generation Projections For Non-Tru Wastes

Remaining Capacities for Trenches

Site	Acres	Waste
Washington	90	
Nevada	60	
South Carolina	250	
Kentucky	60	
New York	200	
	660	6.4×10^6 cubic meters
Illionis*	100	
	760	7.4×10^6 cubic meters

*Assuming current expansion plans are approved.

Estimates of capacity represented by these available acreages were based on the following assumptions:

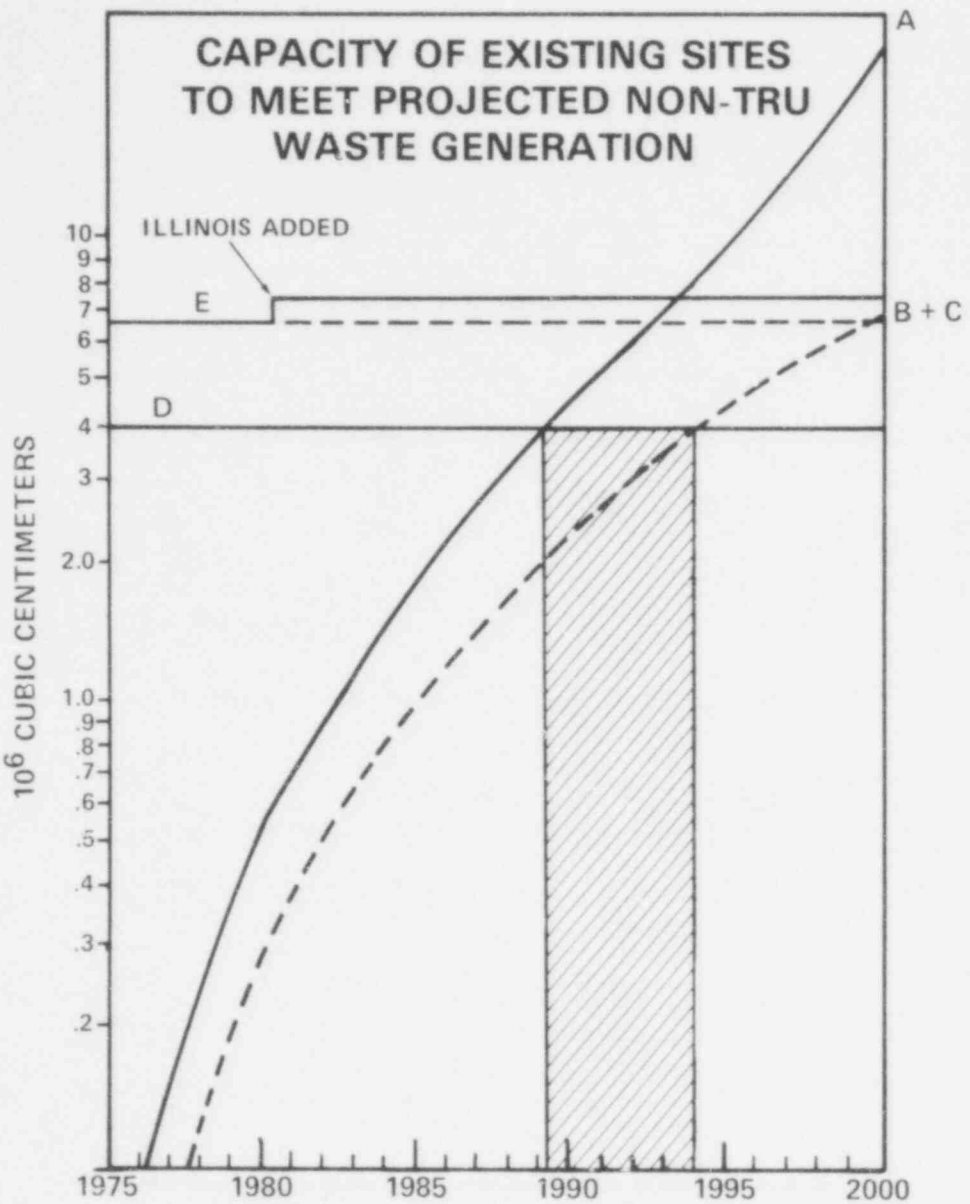
- 2 Trenches/acre
- Trench dimension of 25' deep, 40' wide, 340' long
- A 10 foot spacing on all four sides to allow 70 feet between trenches
- 50% utilization of trench volume

These assumptions provide for the burial of 9.7×10^3 cubic meters of waste per acre.

Remaining capacity assuming utilization of all sites is 6.4×10^6 cubic meters and is shown as E on Figure D-2. (The effects of the Sheffield expansion are also shown.) The capacities shown as D are estimated using remaining space at the Washington, Nevada, and South Carolina sites. As discussed in Appendix C, the future of the Kentucky and New York sites is uncertain. This capacity is to be estimated 3.9×10^6 cubic meters.

Conclusions

Using EPA projections, total capacity should be adequate until 1989 and may suffice collectively, until 1993. Using projections based on ERDA-76-43 and NRC staff estimates of non-fuel cycle waste (curve B + C), total capacity should be adequate until 1994 and beyond. While uncertainties in the projections and estimates exist, they do indicate that adequate time remains for the expiditious development of a low-level waste management program.



CAPACITIES:

D: WASHINGTON, NEVADA, S. C. SITES

E: WASHINGTON, NEVADA, S. C., KENTUCKY, N. Y. SITES

PROJECTIONS (FROM FIGURE D-1):

A: EPA

B + C: NORMALIZED ERDA

Figure D-2: Capacity of Existing Sites to Meet Projected Non-Tru Waste Generation

Appendix E

TRIP REPORTS

SUMMARY OF MEETING WITH ILLINOIS

Attendees:

Illinois:

Joyce C. Lashof, M.D. Director
Illinois Department of Public Health

Gary Wright, Chief
Division of Nuclear Safety

Pete Tedeschi
Division of Nuclear Safety

Philip N. Brunner, Chief
Division of Radiological Health

NRC:

Richard E. Cunningham, Acting Director
Division of Fuel Cycle and Material Safety

Robert G. Ryan, Director
Office of State Programs

Paul Lohaus, State Agreements Program
Office of State Programs

Kitty S. Dragonette, Waste Management Branch
Division of Fuel Cycle and Material Safety

The NRC staff met with Dr. Joyce C. Lashof, Director, Illinois Department of Public Health and members of her staff on July 14, 1976, in Chicago, Illinois. The purpose of the meeting was to discuss with State of Illinois representatives the Federal-State role in the regulation and operation of commercial radioactive waste burial grounds. This report summarizes the preliminary views of Dr. Lashof and her staff on this subject.

The State supports the concept of a national policy and plan for site selection on a regional or national basis rather than a State basis. The State expressed the view that the Federal government should provide leadership in developing criteria for site selection, site operation, site decommissioning, and long-term care. The urgent need for decommissioning criteria was discussed. The State believes an adequate funding system is essential so that this burden will not rest entirely

with the State. In this regard, the State representatives indicated the industry and those benefiting from activities from which the wastes are derived should have a responsibility to bear the cost of the disposal of waste, the decommissioning of sites, and the long-term maintenance. The State was open to the question of the Federal government assuming responsibility for perpetual care funding.

The State representatives indicated that they would not be opposed to Federal operation, administration, ownership and control of the commercial burial grounds. Such Federal controls should stem from a national plan of regional selection of sites. The national plan should consider the number and geographic distribution of sites geared to projected waste generation. Regardless of the Federal role in the regulation and operation of commercial burial grounds, the State representatives were very firm in the position that the State must be assured of active participation to meet their responsibility to assure that the health, safety, and interests of the citizens of Illinois are protected. This would include a continuing need for the State to participate in specific site selection, to assess the regulation and operation of the site and to conduct monitoring and surveillance activities during both the operational and decomissioned long-term phases.

The State expressed the opinion that because of location and other reasons they can exercise better surveillance over activities at the site than the Federal government. The State representatives feel the State is in a better position to respond to the day to day problems at the site.

Illinois is unique among those States in which the shallow land burial facilities are located in that it is the only State that is not an Agreement State. A number of other features are unique and some important points can be summarized as follows:

1. Approximately 70% of the waste buried at the Sheffield site originates from activities within the State of Illinois.

2. The State of Illinois is heavily committed to production of electricity from nuclear power. Statewide, about 23% of the power is produced by nuclear reactors. In the Chicago area about 40 to 45% of the power is produced by reactors.

3. Most of the industrial organizations in Illinois that dispose of waste at the Sheffield site are subject to some State regulatory control. This control may provide a possible source of assessment against the waste generators to provide additional funding for long-term care.

4. The State has an obligation to cooperate with industry and NRC to take steps to assure that disposal capabilities exist at reasonable costs to avoid unnecessary increases in utility rates.

5. Legislative preference has dictated that fees for long-term care purposes collected from the disposal of waste cannot be set aside into separate funds or escrow accounts. This is a longstanding State policy and other efforts to establish a fee system from a licensing program to generate escrow accounts or trust funds have been opposed.

The State staff also offered their views on some of the practical considerations required for decommissioning and long-term care of the Sheffield site. Currently, about 1 1/2 man years are spent annually on inspection and environmental monitoring programs for the site. To properly maintain 120 acres of decommissioned site, as much as two man-years of effort per year might be needed. The efforts of these full time employees would be directed toward activities such as rodent control, vegetation control maintenance of the fence, erosion control, maintenance of drainage, and monitoring trenches.

SUMMARY OF MEETING WITH KENTUCKY

Attendees

Kentucky:

C. Leslie Dawson, Secretary
Department for Human Resources

William P. McElwain, M.D.
Commissioner
Bureau for Health Services

Charles M. Hardin, Manager
Radiation Control Branch

Howard Larson
Department for Human Resources

Robert Slaton
Department for Human Resources

NRC:

Richard E. Cunningham, Acting Director
Division of Fuel Cycle & Material Safety

Robert G. Ryan, Director
Office of State Programs

Paul Lohaus
State Agreements Branch
Office of State Programs

Kitty Dragonette
Waste Management Branch
Division of Fuel Cycle & Material Safety

The NRC staff met with Mr. C. Leslie Dawson, Secretary, Kentucky Department for Human Resources, and members of his staff on July 15, 1976, in Frankfort, Kentucky. The purpose of the meeting was to discuss with Commonwealth of Kentucky representatives the regulation and operation of commercial radioactive waste burial grounds. This report summarizes the preliminary views of Mr. Dawson and his staff on this subject.

The State supports the concept of a national policy and plan for site selection on a regional or national basis rather than a State basis. The State emphasized the need for national criteria for site selection, decommissioning, long-term care, and funding. The State was open to the

question of the Federal goverment assuming responsibility for regulation of the site. At the same time, the State would expect to actively participate in specific site selection and to independently assess the regulation and operation of the site. The State also supports the concept of State surveillance and monitoring of the site under contractual arrangements with the Federal government. Although the Federal government has more resources, the State felt it was in a better position to respond to day to day problems and the Federal government could use existing State competence to regulate the site.

The Department of Human Resources must be assured of active participation to carry out the Department's responsibility to assure that the health, safety and interests of the citizens of Kentucky are protected. This would include a continuing need for the State to participate in specific site selection, to assess regulation and operation of the site and to conduct monitoring and surveillance activities during both the operational and decommissioned long-term phases. Essential to this role is the maintenance within the Department of competent staff with expertise to assess, understand, and deal with radiological matters. This includes a public protection responsibility, police control with respect to radiological matters such as x-rays, medical uses, and maintaining a capability for dealing with unknown radiological problems in the future. This responsibility is independent of the present regulatory system and of the State's Agreement program and would not cease with Federal regulation. The State made the point that government at all levels has difficulty maintaining programs over long periods of time under changing policies and approaches. The State would not favor any changes that might cause the Department to loose their existing radiological expertise.

The discussions also included information concerning Kentucky's experience with the Maxey Flats burial ground. Some important points can be summarized as follows:

1. The Maxey Flats site represents a net loss to the State. Only about 1% of the waste consigned to the site originates in the State of Kentucky. When the original site was selected, its availability was expected to foster economic growth by attracting nuclear industry. These initial expectations have not materialized.

2. The State has faced recent difficulties stemming from the Environmental Protection Agency paper on Maxey Flats published and released in January of this year which the State did not view as objective. They suggested the Federal government establish a policy that would:

   a. require early review and screening of documents to be released to the public by other interested Federal agencies; and

b. require the Federal government to share the burden for responding to public reaction to such documents.

3. The site monitoring, administration, and public relations efforts involving Maxey Flats currently account for approximately 40% of the Radiation Control Branch budget.

4. The expected life of the site depends more on the impact of the new excise tax than on physical capacity. About 20 to 25 acres of the 252 acres at the Maxey Flats site have been used for burial. A lifetime of 20 to 50 years may be possible.

5. The perpetual care fund presently contains about $180,000. The State does not believe current funding arrangements are adequate and estimated that about one hundred to one hundred and fifty thousand dollars will be needed annually to care for the site when it is decommissioned. Under existing arrangements with the site operator, a $430,000 letter of credit has been posted for assuring adequate water management.

6. With respect to the impact of the 10 cents a pound excise tax, both the State and site operator are assessing the situation. NECO will decide on continued operation of the site after a few months time to allow a more realistic assessment of the actual impact. Current assessments indicate that 5% of their previous normal business volume will be received during the coming year. The waste which is presently being received for burial is one to two orders of magnitude higher in terms of number of curies per cubic foot when compared to waste received prior to enactment of the tax bill.

7. The State sees no advantage to closing the site. Closing the site will remove the escrow charge as a source of income for long-term care.

SUMMARY OF MEETING WITH NEVADA

Attendees

Nevada:

Roger S. Trounday, Director
Department of Human Resources

William C. Horton, Supervisor
Radiation Control Program
Department of Human Resources

NRC:

Richard E. Cunningham, Acting Director
Division of Fuel Cycle & Material Safety

Paul H. Lohaus
State Agreements Program
Office of State Programs

Kitty S. Dragonette
Waste Management Branch
Division of Fuel Cycle and
Material Safety

The NRC staff met with Mr. Roger S. Trounday, Director, Nevada Department of Human Resources and Mr. William C. Horton of his staff on July 29, 1976 in Carson City, Nevada. The purpose of the meeting was to discuss with the State of Nevada representatives the Federal-State role in the regulation and operation of commercial radioactive waste burial grounds. This report summarizes the preliminary views of Mr. Trounday and his staff on this subject.

Mr. Trounday indicated the State is not opposed to the Federal government assuming title to the site and assuming responsibility for regulation of the site. He characterized the State's role in such a situation as inspecting and monitoring the Federal regulatory program to insure that the Federal government is doing a good job. The State government in Nevada is believed to have a higher degree of credibility with local citizens than the Federal government. The State must be in a position to carry out its responsibility of assuring protection of the public health and safety. The concept of the Federal government contracting with and paying the States to conduct monitoring and inspections for the Federal government was discussed. If the State continues regulation and land ownership within the present framework, Mr. Trounday expressed concern about adequate financial and other resources at the State level. He indicated the industry should pay to support the State's ongoing and

long-term program and pointed out that licensing fees, adequate perpetual care funding and civil penalties are needed to improve the present fiscal situation.

Mr. Trounday acknowledged that national and regional interests for operation of the Beatty burial ground may not always coincide with the State's interests. He indicated a national waste management plan may be needed. Perpetual care funding for the site is not presently adequate, NECO has not been able to obtain a performance bond and if major problems were to develop at the site the existing perpetual care fund of $230,000.00 would be depleted, leaving no reserve. Mr. Trounday questioned whether the State has sufficient financial or technical resources to deal with a major problem. He suggested that Federal resources should be available to the State if problems develop at the site, and that the Federal government should provide assistance for long term perpetual care and funding requirements.

The following additional points were developed during the discussion:

1. Less than 1% of the waste buried at the Beatty burial ground is generated within the State of Nevada.

2. The State has a responsibility to ensure that barren lands, a major State natural resource, are effectively and adequately utilized.

3. To help meet the interim needs of the State, until Federal guidance is developed, it was suggested that the States having burial grounds and Federal government meet to discuss problems both are facing and to develop a more uniform position on funding and regulatory practices. A subsequent meeting should be held with the industry to inform them of the collective position of the States and NRC.

4. The interaction of the chemical waste disposal site at Beatty has not been factored into the safety analysis for the radioactive waste disposal operation.

5. Recent reassessment of long-term financial needs by Nevada using South Carolina's approach indicates that $.12/ft^3 should be charged to yield $2.7 million in 1993. (Current fees are $.07/ft^3.) Nevada Highway Department estimates on decommissioning costs to close the site are approximately $100,000.

6. The State would welcome more frequent Federal inspections of the site and a more active Federal role under existing licensing arrangements.

7. The State presently devotes about one (1) professional man-year/year to the NECO site of the two (2) professional staff in the Department's radiation control program.

8. The State is not satisfied with the legal or financial terms of existing leases with the operator.

SUMMARY OF MEETING WITH NEW YORK

ATTENDEES

New York:

Cita Simian, Office of the Governor

Richard Werthamer, Ph.D. Chairman
Energy Research and Development Authority

William E. Seymour, Ph.D. Staff Coordinator
Atomic Energy Council

Theodore L. Hullar, Deputy Commissioner
for Programs and Research
Department of Environmental Conservation

Thomas J. Cashman, Director
Bureau of Radiation
Department of Environmental Conservation

Sherwood Davies, Director
Bureau of Radiological Health
Department of Health

Francis J. Bradley, Ph.D.
Radiological Health Unit
Department of Labor

James B. Keating, Power Division
Public Service Commission

Fred V. Strnisa, Ph.D. Atomic Energy Council

Michael Curley, Counsel
Department of Commerce

Sandra M. Caron, Asst. Counsel
Department of Commerce

NRC:

Robert G. Ryan, Director
Office of State Programs

Richard E. Cunningham, Acting Director
Division of Fuel Cycle and Material Safety

Paul. H. Lohaus, State Agreements Program
Office of State Programs

Kitty S. Dragonette, Waste Management Branch
Division of Fuel Cycle and Material Safety

The NRC staff met with representatives of New York State in New York City on August 13. The purpose of the meeting was to discuss with New York State representatives the regulation and operation of commercial radioactive waste burial grounds. This report summarizes the preliminary views of the State representatives on this subject.

The State representatives first characterized the roles of the various State organizations present.

Department of Commerce/Atomic Energy Council

The Department of Commerce provides staff to the Atomic Energy Council and the Commissioner of Commerce serves as the Chairman. The Council is responsible for coordination of activities of several State agencies having nuclear regulatory functions. A bill recently enacted, will transfer functions of the Council to a newly created Energy Office.

Department of Environmental Conservation

The Department of Environmental Conservation (DEC) is responsible for controlling all discharges of material to the environment which includes the land burial of radioactive material. The DEC administers an exemption from Part 16 of the State Sanitary Code which authorizes burial of waste at West Valley. The DEC assumed regulatory responsibility in October 1974 when Part 380 was promulgated. NFS was notified that the existing Health Department exemption would serve as the DEC permit pending the updating of the permit. The DEC also carries out an environmental surveillance program at the NFS site.

Department of Health

The Department of Health is responsible for regulating medical and educational users of radioisotopes under the New York Agreement. The Department is responsible for general public health aspects relating to the NFS burial ground. The Department provides laboratory support services for the DEC environmental monitoring program.

Department of Labor

The Department of Labor is responsible for regulating industrial users of radioisotopes under the New York Agreement. The Department is concerned with employee health and safety and licenses above ground possession and use of material at the NFS burial ground.

Energy Research and Development Authority

The Authority, a public benefit corporation, is responsible for fostering development and use of various energy sources in the State. The Authority owns the NFS site, administers an agreement with NFS for site operation and has financial responsibility relating to long term care.

The low-level burial ground has to be considered in the context of other activities at the West Valley site which include a fuel reprocessing plant, fuel hull disposal area and high-level waste storage area. The Authority holds the escrow account presently containing about 2.9 million dollars which applies to both the high-level waste and low-level burial ground. Although the two cannot be separated, the State estimated about $210,000 has been derived from the low-level waste escrow account charge. (Initially $0.08/ft^3 was collected. For 1975 the rate was increased to $0.15/ft^3). The Authority's agreement with NFS provides that the escrow fund should eventually reach 4 million dollars. If responsibility for the site were to revert back to the Authority by forfeiture, NFS would be required to bring the fund up to 4 million dollars. (The 4 million dollar cost estimate was based on an early study which contemplated perpetual tank storage of the high-level waste; not solidification as is presently required for high-level waste by Part 50.)

The State estimated that about 2.4 million cubic feet of low-level waste has been buried at the site, 20% of which was generated by the NFS reprocessing plant. The State estimated 30-50% of the waste at the burial site was generated within the State.

The NFS burial ground was voluntarily closed by NFS in March 1975 due to liquids, containing low levels of radioactivity, seeping out of the soil cap of completed trenches in the north end of the site. The State has not allowed operations to resume at the site pending further results of USGS and EPA studies. Preliminary results show near surface ground water in the north end and to the west of trench #14 in the south end. The site will not be reopened until the State has an opportunity to further evaluate the corrective actions being taken at the north end and potential modifications in trench construction and site operation. Before reopening the site, NFS wants a statement from the State concerning the State's requirements for operation of the site.

There are also legal considerations involved regarding the future of the site. In April 1976, NFS wrote to the Authority announcing their intention of turning back control of waste storage facilities to the Authority by October, 1976. A number of terms and conditions must be met before transfer of facilities can take place. The Authority estimated the process would be lengthy and the question of turnover would be tied to the question of disposition of the high-level waste.

The State has considered the value of continued operation of the site to the State but has not arrived at a position. New York has a growing commitment to nuclear power and minimizing disposal costs might help in keeping electrical rates down. In addition, one representative indicated that as costs for disposal at the burial grounds increase, individual licensees may request approval from the regulatory agencies to incinerate, store and bury waste at the licensee's facility.

The State agreed that a national plan is needed for site selection on a national or regional basis rather than a State basis. They emphasized the need for national criteria for site selection, decommissioning, long-term care and funding.

Regardless of whether the site were owned and regulated by the State or Federal governments, the State would want to participate in site selection, evaluation and monitoring and to independently assess site regulation and operation. The Department of Environmental Conservation indicated that regardless of who owns and regulates the site the State should have the opportunity to add more stringent radiological criteria, including those for offsite receiving waters, than might be imposed by the Federal government. The concept of State surveillance and monitoring of the site under contract with the Federal government was discussed. The State expressed no firm preference concerning State versus Federal ownership of land, but acknowledged that if the site were under Federal control, the State would probably have less control over future expansion and operation. The existing perpetual care fund is not adequate and if the State continued to own the site the perpetual care charge would need to be increased when operations resume. The State believes it does not have adequate resources to make major improvements or changes to the burial site.

SUMMARY OF MEETING WITH SOUTH CAROLINA

ATTENDEES

South Carolina:

John H. LaFitte, Jr., Office of the Governor

E. K. Aycock, M.D., Commissioner
Department of Health and Environmental Control

LaMar E. Priester, Jr., Ph.D.
Deputy Commissioner for Health and Safety

Heyward G. Shealy, Chief
Bureau of Radiological Health

NRC:

Richard E. Cunningham, Acting Director
Division of Fuel Cycle and Material Safety

Robert G. Ryan, Director
Office of State Programs

Paul Lohaus, State Agreements Program
Office of State Programs

Kitty S. Dragonette, Waste Management Branch
Division of Fuel Cycle and Material Safety

The NRC staff met with Dr. E. K. Aycock, Commissioner, South Carolina Department of Health and Environmental Control, members of his staff, and John LaFitte, representing the Governor's Office on August 6, 1976, in Columbia, South Carolina. The purpose of the meeting was to discuss the regulation and operation of commercial radioactive waste burial grounds. This report summarizes the preliminary views of the State representatives on this subject.

The State supports the concept of a national policy and plan for site selection on a regional or national basis rather than a State basis. The State emphasized that a survey to assess regional needs should be conducted as soon as possible to assist in planning new sites. The State's experience has shown that commercial operators have a continuing interest in low-level waste disposal. The State also noted that the long-term viability and stability of commercial operation of the site must be weighed against the stringency of requirements that may be imposed by regulatory authorities.

The State agreed with the need for national standards and criteria in both the economic and technical areas. The State would welcome technical assistance and support from the Federal Government. For example the State hopes to use the USGS data which is being generated at the South Carolina site to redesign the site monitoring program. The State emphasized the need for a Federally backed contingency funding program. The State reaffirmed their position as stated in testimony delivered before the House Committee on Government Operations on April 6, 1976.

In reaffirming the position stated there, the State feels that the individual States can and should regulate the sites. A number of advantages to State regulation were noted including the frequent monitoring and surveillance of activities at the site, greater credibility with the citizens of the State, and the every day contact of the State departments with the citizenry. The State also sees a number of advantages in State ownership of the site land. During the operational phase, the land provides some indemnification should the operator abandon the site. After the site is closed, revenue generating activities, such as, agricultural activities or recovery and reuse of materials may still be possible at the site. The State does feel a responsibility to the citizens of South Carolina to assure waste disposal capacity because of the State's commitment to nuclear power but does not feel that the citizens of the State should have to bear the burden for out of State waste.

The discussions also included some information drawn from South Carolina's experience with the Barnwell site and areas where further study may be indicated. Some of the important points can be summarized as follows:

1. The State estimated that 5 to 6 percent of the waste buried at the site is generated within the State of South Carolina. Because of the prohibition against special nuclear materials, initiation of activities at the Barnwell reprocessing facility would not be expected to have a major impact.

2. The escrow fund for long-term care of the site now contains approximately $251,000. Estimates of operations through the year 2000 indicate that approximately $3,000,000 should accumulate in the fund.

3. The State is considering the question of how to obtain additional resources to meet the increased monitoring expenses from increased traffic to the site from out-of-State wastes. The current license

fees do not cover the Departments' expenses with respect to Chem-Nuclear activities which were estimated to be about $25,000 a year. The State is exploring the feasibility of imposing a new tax on out-of-State waste coming into the site to cover such cost. In addition, if present trends and difficulties with other sites continue, South Carolina may have to consider restricting the burial of waste to that from the southeastern region.

4. The extent of DOT controls which might be brought to bear to limit interstate shipments of waste should be examined. Safety in transit is the prime concern of DOT regulations; however, additional authority may exist.

SUMMARY OF MEETING WITH WASHINGTON

ATTENDEES

Washington:

Donald Stevens, Office of the Governor

Milton Burdman, Secretary
Department of Social & Health Services

John Beare, M.D., Director
Health Services Division
Department of Social & Health Services

Sam Reed, Chief
Office of Environmental Health Programs
Department of Social & Health Services

Robert Will, Supervisor
Radiation Control Unit
Department of Social & Health Services

Lee Gronemyer
Radiation Control Unit

Nancy Kirner
Radiation Control Unit

Fred Adair, Executive Director
Nuclear Energy Department
Department of Commerce & Economic Development

John Rankin, Director
State Energy Office

NRC:

Robert G. Ryan, Director
Office of State Programs

Richard E. Cunningham, Acting Director
Division of Fuel Cycle & Material Safety

Paul Lohaus, State Agreements Program
Office of State Programs

Kitty S. Dragonette, Waste Management Branch
Division of Fuel Cycle & Material Safety

The NRC staff met with representatives of the State of Washington on July 30, 1976, in Olympia, Washington. The purpose of the meeting was to discuss with State of Washington representatives the Federal-State role in the regulation and operation of commercial radioactive waste burial grounds. This report summarizes the preliminary views of the State representatives on this subject.

The State representatives indicated the Hanford burial ground was promoted to provide transition from Federal government to private operation of the local nuclear industry and to help fill the economic gap resulting from slowdowns in Federal operations at the Hanford site. The State expressed concern about efficiency of the nuclear cycle from the economic standpoint and insuring adequate waste management capability for the State. However, they recognized that proliferation in the number of sites, disposal capacity, transportation considerations, etc., are regional and national problems as well as State problems. They expressed the view that the State should continue to regulate, license, inspect and monitor the burial ground since the State has a more direct responsibility to Washington State citizens than the Federal government, and the State has a better understanding of needs of the State and is motivated to do a better job. They believe the record demonstrates the State can do a good job and although the State may not always have better technical resources, it is generally more perceptive of problems at the State level and can respond more quickly to contingencies. They further indicated the State has responsibility for all matters affecting health and safety within the State and the citizens expect the State Health Department to carry out this responsibility. The State must, therefore, have a strong involvement no matter who carries out the regulatory responsibilities.

They also indicated that Federal control from a distance is not always effective in dealing with problems at the State level. They cited problems experienced during preoperational monitoring of the Trojan Plant. The State had brought concerns of local citizens regarding the Trojan Plant to the attention of the NRC which they believe were not effectively resolved. They believe a situation such as this reinforces the need for control at the State level.

The representatives pointed out that the problems being experienced at the burial grounds in certain States should not necessarily affect the manner in which Washington controls the Hanford site. The State feels

it can properly control NECO through the license and sublease. If the site was run by the Federal government, the State would have to work through the Federal government to institute changes at the site which they feel might afford them less control over the site's activities. They pointed out that the Federal government tends to escalate and nationalize problems being experienced in some States and Federal control is not the only answer. The State feels that separation of problems into specific issues and resolving the individual issues through cooperative Federal/State efforts is a proper approach. The State also expressed the general view that Federal regulations that provide objectives and direction and allow States flexibility in interpretation and implementation are preferable.

In summary, the State believes the following are needed: (1) improved Federal/State cooperative efforts; (2) guidelines on the role of the Federal and State governments in the regulation of the sites; (3) uniformity in regulatory practices and procedures; (4) Federal guidance on perpetual care maintenance and funding requirements from which specific site criteria can be developed; and (5) a continued active role for the State in the selection, operation and regulatory control of the sites.

The discussions also included information concerning Washington's experience with the Hanford burial ground. Some important points can be summarized as follows:

1. The Hanford site is currently the only site accepting commercial transuranic wastes. Negotiations between ERDA and the State concerning ERDA's requests to retrievably handle the wastes as ERDA does are in progress. A number of financial issues have not been resolved.

2. Washington estimates that probably more than 30% but less than 70% of the waste buried originates with the State.

3. Only about 3% of available capacity has been used. The operator has subleased 100 acres and the State has leased 1,000 acres.

4. The State lease of Federal land at the ERDA-Hanford Reservation is for 99 years. The State/NECO lease includes review provisions during its 10-year duration and two 15-year renewal options. The terms do not include who will assure the financial burden for the site if the lease is not renewed.

5. $40,000 in escrow funds have been collected for long-term care. No performance bond has been posted. Fees collected are 8¢/cubic foot.

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