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Report to Joseph M. Hendrie, Chairman, Nuclear Regulatory Commission; by Monte Canfield, Jr., Director, Energy and Mineral Resources Div.

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Nuclear powerplant operations generate the greatest volume of low-level radioactive wastes. Because of a lack of adequate burial space on the east coast, there is a need for Federal policy to encourage utilities to reduce waste volumes. Waste-treatment systems installed in nuclear powerplants to handle low-level wastes have experienced operational difficulties resulting in increasing the potential for unnecessary exposures to nuclear powerplant workers and unplanned releases to the environment. Recommendations: The Nuclear Regulatory Commission should: require that waste-treatment-system performance, operability, operator training, and management control be assessed to a greater extent than is currently being done during its licensing and inspection efforts; establish a system for monitoring the performance and reliability of waste-treatment systems in operation to insure that poor performing systems are not used in new plants and that releases and exposures are kept to the lowest level reasonably achievable; revise existing procedures to insure that major changes to waste-treatment systems are reviewed and approved by the Commission in a timely manner prior to implementation by the utilities; determine on a priority basis the safety of the contractor mobile waste-solidification system currently being used to insure that there are no unanswered safety questions; consider the chemical composition of low-level waste when approving the design of waste systems and evaluate their effects on the performance of waste-treatment systems in operation; and undertake a study aimed at minimizing waste volumes being generated at existing plants. (Author/SC)

7385

REPORT BY THE U.S.

General Accounting Office

Need For Greater Regulatory Oversight Of Commercial Low-Level Radioactive Waste

Nuclear powerplant operations generate the greatest volumes of low-level radioactive wastes. Because of a lack of adequate burial space on the east coast, there is a need for Federal policy to encourage utilities to reduce waste volumes.

Waste treatment systems installed in nuclear powerplants to handle low-level wastes have experienced operational difficulties resulting in increasing the potential for unnecessary exposures to nuclear powerplant workers and unplanned releases to the environment.

GAO recommends that the Nuclear Regulatory Commission place greater emphasis on the licensing, inspection, and monitoring of low-level waste treatment systems and take actions aimed at reducing waste volumes.



EMD-78-101

AUGUST 16, 1978



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

ENERGY AND MINERALS
DIVISION

B-164105

The Honorable Joseph M. Hendrie
Chairman, Nuclear Regulatory
Commission

Dear Dr. Hendrie:

We have surveyed (1) the performance of low-level waste treatment systems installed at nuclear powerplants and (2) the Nuclear Regulatory Commission's role in reducing low-level waste volumes. During our study we found that:

- Greater Federal involvement is needed in the licensing, inspection, and monitoring of low-level waste treatment systems to insure that (1) they perform as intended without unnecessarily exposing workers and the environment to radiation and (2) ineffective waste treatment systems are not installed in new nuclear powerplants.
- There is a need for Federal policy to encourage utilities to reduce waste volumes. This is particularly significant now that there is inadequate burial space on the east coast and more waste will have to be shipped to the west coast resulting in increased costs and the greater potential for transportation accidents involving radioactive materials.

We know you are concerned about the effective management of radioactive waste and how it is affecting the social acceptance of nuclear power; therefore, we trust that the issues discussed in this report will encourage you to push for even greater Federal emphasis in this important area.

We made this survey as part of our evaluation of the effectiveness of the Commission's regulatory activities as required by the Energy Reorganization Act of 1974 (42 U.S.C. 5876).

This report contains recommendations to you on page 14. As you know, section 236 of the Legislative Reorganization Act of 1970 requires the head of a Federal agency to submit a

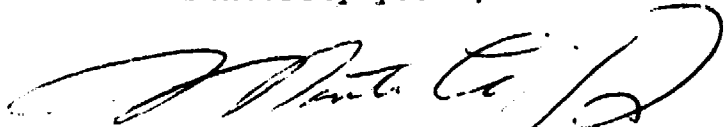
written statement on actions taken on our recommendations to the House Committee on Government Operations and the Senate Committee on Governmental Affairs not later than 60 days after the date of this report, and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are also sending copies of this letter to other interested congressional committees, the Office of Management and Budget, and the Secretary, Department of Energy.

The report has been discussed with the Nuclear Regulatory Commission staff and they did not disagree with the facts provided or the recommendations made.

We appreciate the courtesy and cooperation extended to our representatives.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Monte Canfield, Jr.", written in a cursive style.

Monte Canfield, Jr.
Director

D I G E S T

Low-level radioactive waste treatment systems at nuclear powerplants have experienced many operational difficulties caused by inadequate equipment and poor performance in other plant systems. Although Commission officials attribute only about 5 percent of all occupational exposures to radioactive waste treatment systems, GAO believes that actions need to be taken to prevent the incidence of any unnecessary exposures to plant workers.

GAO found that:

- Waste treatment system operational problems have increased the potential of worker exposure to unnecessary radiation and have caused unplanned releases of waste to the environment.
- Waste treatment systems are not reviewed to the same degree as safety systems because the Commission views their operation as not significantly affecting public health and safety. As a result, the performance of these waste treatment systems, including operator training and management control, receive less Commission attention during licensing and inspection.
- Some waste treatment systems are not meeting actual operating demands placed on them by the nuclear plant.
- The Commission does not routinely monitor the reliability of waste treatment systems to insure that those which prove ineffective in operation are not installed in new plants and are not creating health or safety problems.
- Changes made to waste treatment systems by utilities are not routinely reported to the Commission before being implemented into plant operations.

EMD-78-101

--Contractor mobile waste solidification systems used at nuclear powerplants have not been reviewed by the Commission for safety.

GAO believes that if the Commission placed greater emphasis on waste treatment systems during its licensing and inspection efforts, the potential of unnecessary exposures to nuclear plant workers and unplanned waste releases to the environment could be reduced. Although actions are being taken by the Commission and industry to improve waste treatment systems, the Commission will not be able to measure the effectiveness of these efforts unless it establishes a system for monitoring the performance and reliability of waste treatment systems in operation.

Low-level radioactive wastes generated from nuclear powerplants represent one of the greatest volumes of waste in the nuclear fuel cycle. Finding adequate burial sites for this waste is becoming a problem. Studies have estimated that the present burial system consisting of shallow land burial grounds may be exhausted by the mid-1980s.

Because of operational problems and plant disposal procedures nuclear powerplants are generating larger volumes of low-level radioactive waste than initially estimated. The Commission has not established a policy for limiting the volumes of solid radioactive waste generated by nuclear powerplants.

Volume reduction methods could be a significant aspect of the Commission's overall regulatory efforts because

--if implemented they could extend the life of existing burial grounds beyond the year 2000.

--the Commission has and may continue to face socio-political and technical problems in licensing expansion of existing burial grounds or in licensing new burial grounds.

The nuclear industry is taking some actions on their own to reduce waste volumes. However,

GAO believes that because radioactive waste management is a social and national issue, the Commission should take the lead by adopting a Federal policy to reduce waste volumes.

The Commission has started an ambitious program aimed at providing guidance for selecting new burial grounds and disposal alternatives for low-level radioactive waste. Due to the recently imposed burial restrictions by the State of South Carolina on the only operating burial grounds on the east coast and lack of assurance that a similar situation will not occur at western burial sites, the Commission has requested the Department of Energy for the use of their land burial sites as backup facilities. The use of these burial sites appears to be a more reasonable alternative than opening new burial lands.

GAO recommends that the Nuclear Regulatory Commission:

- Require that waste treatment system performance, operability, operator training, and management control be assessed to a greater extent than is currently being done during its licensing and inspection efforts.
- Establish a system for monitoring the performance and reliability of waste treatment systems in operation to insure that poor performing systems are not used in new plants and that releases and exposures are kept to "as low as is reasonably achievable" levels. To a greater extent, Commission inspectors should be required to report to licensing officials on poor performance found in waste treatment systems. Licensing officials should consider this information during their reviews of new power-plant waste treatment systems.
- Existing procedures should be revised to insure that major changes to waste treatment systems are reviewed and approved by the Commission in a timely manner before being implemented by the utilities.

- Determine on a priority basis the safety of the contractor mobile waste solidification system currently being used to insure that there are no unanswered safety questions.
- Consider the chemical composition of low-level waste when approving the design of waste systems and evaluate their effects on the performance of waste treatment systems in operation.
- Undertake a study aimed at minimizing waste volumes being generated at existing plants and adopt a policy on volume reduction requiring operating plants and those undergoing licensing review to evaluate the costs and benefits of adopting volume reduction techniques and in reducing waste volumes.
- Pursue on a priority basis the option of using Department of Energy burial sites as backups to commercial sites in accepting commercial low-level wastes.

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CHAPTER 1

INTRODUCTION

All operations that produce or use nuclear materials generate low-level radioactive waste. Typical commercial sources include university and industrial research centers, medical diagnostic and treatment units, nuclear powerplant operations and related nuclear fuel cycle activities. Nuclear powerplant operations, however, produce the largest volume of low-level waste. Although this waste is low-level, containing small quantities of radioactivity, it is none-the-less hazardous and must be treated and handled with adequate precautions.

As of January 1978 there were 67 nuclear powerplants licensed to operate in the United States and by the year 2000 the Department of Energy (DOE) projects as many as 330 operating plants. Since the beginning of commercial land burial operations in 1962 through December 1977, more than 18 million cubic feet of radioactive wastes have been buried. According to one industry report, by the year 2000, commercial nuclear plants could generate a total of 230 million cubic feet of waste, or approximately 80 percent of all low-level waste.

All nuclear powerplants have waste treatment systems designed to handle low-level wastes prior to release into the environment or shipment to a burial ground. Low-level waste is generated in liquid, gaseous, and solid forms. Liquid waste treatment processes employ a variety of methods to reduce radioactivity in liquid waste released into the environment. Such treatment methods include storage for decay, filtration, demineralization, and evaporation of the liquid waste. Several treatment methods are also used to reduce radioactivity in gaseous waste before release into the environment. These methods include storage for decay, distillation, absorption, and filtration.

The materials used to treat liquid and gaseous wastes and the remaining residues, such as concentrated liquids, used filters, evaporator bottoms, and demineralizer resins, contain most of the captured and longer-lived radionuclides and comprise the major quantity of solid waste generated at a nuclear plant. These wastes are dewatered and solidified, and are packaged and shipped to commercial land burial grounds. Currently there are six low-level waste burial grounds located at West Valley, New York; Barnwell, South Carolina; Morehead, Kentucky (Maxey Flats); Sheffield, Illinois; Beatty, Nevada; and Richland, Washington. Additional quantities of slightly contaminated or suspect solid radioactive waste in the form of plastic bags, paper trash, and packing material are also shipped to burial grounds for disposal.

SCOPE OF REVIEW

We have studied the performance of low-level waste treatment systems installed at nuclear powerplants and the Nuclear Regulatory Commission's (NRC's) role in reducing low-level waste volumes. In conducting our review, we examined licensing files for four commercial reactors, environmental reports and other documentation, and spoke with officials at

- four more commercial nuclear powerplants, two operating and two in licensing review stages;
- NRC headquarters in Bethesda, Maryland;
- NRC regional offices at Atlanta, Georgia, and King of Prussia, Pennsylvania; and
- DOE offices in Germantown, Maryland.

CHAPTER 2

STRONGER REGULATORY EMPHASIS NEEDED

ON LOW-LEVEL RADIOACTIVE WASTE TREATMENT SYSTEMS

Waste treatment systems are not reviewed to the same degree as "safety systems" by NRC because they are not considered as significantly affecting public health and safety. As a result, these systems, including operator training and management control, receive less attention during licensing and inspection than those systems NRC determines to be safety-related. Also, NRC does not routinely monitor the performance of radioactive waste treatment systems to insure that those systems which prove ineffective in operation are not used in new plants and are not creating a health or safety problem to nuclear plant workers.

While radiation exposures from low-level waste treatment systems do not pose as great a threat to the public health and safety as high-level wastes, they may be contributing to increased occupational exposures. During our review, we found that operational difficulties in waste treatment systems and poor performance in other plant systems caused 11 nuclear powerplants to change their waste treatment systems, which were originally licensed and approved by NRC. In seven of these plants, one reason given for the change was to reduce occupational exposures. We believe that if waste treatment systems prove ineffective in operation they can create health and safety problems and therefore greater NRC oversight of low-level waste treatment systems is needed to insure that they perform adequately.

NRC LICENSING NEEDS TO PLACE GREATER EMPHASIS ON DETAILED PERFORMANCE OF WASTE TREATMENT SYSTEMS

We examined two nuclear powerplants at various stages of licensing and found that NRC placed little emphasis on requiring utilities to define the detailed performance required from liquid and solid waste treatment systems. According to NRC and industry officials, liquid waste evaporators and solid waste equipment, in particular, have failed to perform adequately in operating plants. At one plant undergoing a licensing review, the applicant told NRC that the solid waste treatment system to be installed was similar to one used in two operating plants. According to one NRC official, the performance of this system once in operation in the two plants was never evaluated by the licensing staff. Officials at these two

plants advised us that their solid waste treatment systems have not operated effectively and were unable to solidify waste.

We also found that during the design review of a liquid waste treatment system, NRC does not consider the chemical composition of the waste. An NRC official stated that unanticipated chemicals have been found in liquid waste treatment systems causing problems with evaporators and demineralizers which in some cases resulted in plants exceeding their technical specifications for radioactivity in liquid effluents or shipments of radioactive liquid offsite.

We believe NRC should assess the detailed performance of waste treatment systems during its licensing and inspection process and also should begin considering the chemical composition of low-level waste when reviewing the designs of waste treatment systems and evaluate the effects these chemicals have on the performance of waste treatment systems in operation.

WASTE TREATMENT SYSTEMS ARE NOT MEETING ACTUAL OPERATING DEMANDS

NRC's licensing staff reviews the capability of liquid waste treatment systems to process average liquid quantities of waste projected for the life of the plant. It also analyzes how the system could be manually manipulated in the event larger than anticipated amounts of waste are generated. They do not, however, address waste operator qualifications to perform this process.

At one powerplant we visited, we were advised that waste operators had to manually manipulate the waste treatment system because it was not adequate to process the large volumes of waste being generated. To maintain "as low as is reasonably achievable" release limits, provide continued plant operations, and handle larger waste volumes, the plant operators had to use the basement floor for liquid waste storage. This resulted in increasing the potential of exposing workers to unnecessary radiation, damage to electrical and mechanical equipment, and personal injury from operating the plant while wading in water. This plant changed its liquid waste treatment system in mid-1976 to handle larger waste volumes; however, according to plant officials, this change has not eliminated the need of allowing waste to back up on the basement floor.

Not only was the change inadequate, but NRC was not notified of the change until almost 2 years later. We believe NRC

should be notified of major changes to waste treatment systems so they can be reviewed and approved before being implemented.

NRC MONITORING OF WASTE TREATMENT SYSTEM PERFORMANCE NEEDS IMPROVEMENT

NRC currently does not routinely monitor the performance of waste treatment systems in operation. As a result, NRC does not have a data base which it could use to develop guides on which generic waste treatment system equipment is best for a particular reactor design or to assure itself that those systems which prove ineffective in operation are not creating a health or safety problem or are used in new plants.

In 1976 NRC attempted to verify the accuracy of its models for evaluating radioactive waste treatment systems and calculating liquid and gaseous waste releases. However, because NRC does not have an adequate data base, it had to rely on the utilities for performance data. Although this study is almost completed, two NRC officials have stated that the information obtained is of limited use because the utilities do not provide adequate and detailed performance data.

Although NRC inspectors monitor some aspects of waste treatment systems in operation, they are currently not required to inspect the system's performance because they consider this the utility's responsibility. Instead, these inspections place primary emphasis on verifying that recorded radioactive releases and exposures are within regulatory limits. The operating performance of a system concerns inspectors only when releases or exposures exceed established limits. NRC officials told us that when NRC inspectors become aware of a poor operating waste treatment system, it is not routinely reported to NRC licensing officials.

We believe this information could be very useful in NRC's licensing reviews and should be made available to licensing officials so that poor performing systems are identified, corrected, and not used in new powerplants.

NEED TO DETERMINE THE SAFETY OF CONTRACTOR MOBILE WASTE SOLIDIFICATION SYSTEMS

There are currently about five contractors providing waste solidification services to some utilities because plant waste treatment systems are unable to handle the amount of waste being generated. Although these contractors have various NRC and State material licenses which permit them to handle radioactive material, the operating safety of these systems at nuclear plants is not reviewed by NRC. According to NRC officials,

the plants are responsible for seeing that these systems operate safely in accordance with their licenses.

Because the operating safety of mobile waste solidification systems have never been reviewed by NRC, we are concerned about the safety of workers and the environment caused by natural phenomena because, according to NRC, the nuclear plant structure is totally relied on to contain other waste system failures should they occur. Mobile units located outside of the nuclear plant could create safety risks to workers and the environment which have not been fully evaluated by NRC. We believe that mobile units should be reviewed for safety of operation by NRC on a priority basis.

CHAPTER 3

NRC ACTIONS NEEDED TO REDUCE

LOW-LEVEL WASTE VOLUMES

NRC has estimated that the present commercial low-level waste burial system could be exhausted by the mid-1980s. This could threaten the continued operation of nuclear powerplants unless actions are taken to reduce waste volumes, build more storage space, expand existing burial sites, and develop alternative disposal methods.

NRC has faced socio-political problems in expanding one existing burial site and could face similar problems in expanding and developing new burial grounds. If volume reduction were a significant aspect of a low-level waste management program, the already available capacity at licensed sites could be extended. One industry report indicates that if volume reduction systems were commercially available and were fully implemented in all operating and future nuclear powerplants, existing licensed burial capacity could be extended beyond the year 2000.

However, NRC currently has no policy for limiting the volumes of solid radioactive waste generated at nuclear powerplants. Although the nuclear industry is taking some actions on its own in this area, we believe a Federal policy on reducing waste volumes is needed to prevent the shutdown of existing and future nuclear powerplants because of inadequate commercial burial space.

CURRENT DISPOSAL SYSTEM

There are six commercially-operated low-level waste burial grounds; however, three of the four burial sites in the eastern United States, located at West Valley, Maxey Flats, and Sheffield, are no longer accepting waste for burial. As a result, the Barnwell, South Carolina, facility is the only eastern burial site remaining fully operational.

However, for economic and political reasons, South Carolina recently imposed a monthly limit on the amount of waste buried at Barnwell. This ceiling of 135,000 cubic feet a month will not be sufficient to allow Barnwell to handle all east coast burial demands. Officials from South Carolina have stated this burial limitation will initially be somewhat flexible and should not result in any utility shutdown or hazardous situations.

As a result of the limitations and the closing of other east coast sites, NRC has projected that approximately 50,000 cubic feet of east coast generated waste a month will have to be transported to western burial sites. This will result in higher operating costs to the utilities and eventually to the consumer. Also, the possibility of transportation accidents and exposures from shipping waste longer distances will increase. The limitation could also result in low-level waste being stored temporarily at the powerplant site. Because some plants have limited onsite storage capacity, this also could result in increased operating costs to the utility and increased risk of occupational exposures. Also, since NRC has limited authority over burial sites, there is no assurance that similar burial restrictions will not be placed on the western burial sites.

LICENSING ACTIONS AND OPERATIONAL
PROBLEMS CONTRIBUTE TO INCREASED
SOLID WASTE VOLUMES

Waste volumes generated by nuclear powerplants have been larger than originally estimated because of operational difficulties in plant systems, such as condensor and steam generator leakage, waste system malfunctions, and overall increased leakage from pumps, valves, and fittings, causing the generation of more liquid and solid waste. In addition, starting in September 1978 when NRC issues new specifications requiring that all waste being shipped to burial grounds be in a solid form, the volume of solid waste requiring disposal could increase. According to NRC officials, this new regulation could result in larger solid waste volumes because more liquid wastes would have to be processed and the addition of solidification material to liquid wastes will increase solid waste volumes.

Even without these new solidification regulations, waste volumes generated by nuclear powerplants have been increasing. For example, at two operating plants we visited, increasing amounts of solid waste were being generated as shown in the following table.

CALENDAR YEAR TOTALS OF SOLID WASTE SHIPPED

	<u>1972</u>	<u>1973</u>	<u>1974</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>
	------(cubic feet)-----					
Plant 1	5,648*	12,880	42,700	325,000**	24,700	28,000
Plant 2	--	1,066*	18,000	20,000	42,300	89,100

*First year of plant operation.

**This increase resulted primarily from a failure in the plant evaporator and unusually large amounts of contaminated trash.

Officials at plant number 1 told us that solid waste volume increases were due to leaking steam generators and poor performance of their liquid waste system. As a result, this plant changed its liquid waste system to process larger waste volumes. In plant number 2 officials told us their solid waste quantity increases were a result of more leaks from condensers, valves, pumps, and fittings than originally estimated. This increased leakage requires more processing, resulting in greater solid waste volumes.

NRC AND UTILITY ACTIONS TO REDUCE
LOW-LEVEL SOLID WASTE VOLUMES

NRC has not established a policy on solid waste volume reduction because it feels that volume reduction is an operation and economic consideration of each individual plant rather than a public safety issue. As a result, NRC does not require licensees to indicate how they plan to reduce solid waste volumes.

At the two operating plants visited, plant officials told us they have taken some measures to reduce solid waste volumes. They said their employees are trained on waste reduction techniques, and where possible, reusable articles are being used and more stringent controls are being placed over waste volume fluctuations. These efforts have been economically motivated rather than NRC initiated. At both plants, utilities were studying ways of improving waste treatment system operations, which includes volume reduction considerations.

At the two plants we surveyed under licensing review, the applicants provided NRC general information on the quantities of waste expected to be discharged; however, there was no mention of what additional steps could be taken to reduce solid waste volumes and its resulting benefits. We did find that four other plants were adopting and considering ways of reducing solid waste volumes by applying available technology.

One utility study indicated that by installing solid waste volume reduction technology, plants could save about \$500,000 annually and these savings would increase if future transportation and disposal costs increase drastically--as may now be the case with insufficient burial space on the east coast.

Technology has been developed that could significantly reduce volumes of solid radioactive waste. Methods include incineration, improved evaporator systems, dryers, calciners, and improved solidification systems. While there are economic benefits from installing volume reduction systems, there may also be risks involved. According to several NRC officials, these risks include (1) potential for increased occupational exposures, (2) potential for increased quantities of radioactive effluents, (3) shipments of higher concentrations of radioactive wastes, and (4) associated economic and societal costs. NRC is planning a study on the risks and benefits associated with commercially available volume reduction techniques. According to one NRC official, the study, expected to be completed in late calendar year 1979, will be used by the staff to develop an overall low-level waste regulatory program. This program is expected to be completed by 1980-1981.

NRC'S LOW-LEVEL REGULATORY PROGRAM COULD BE IMPROVED

In 1977 NRC started an ambitious program aimed at developing a comprehensive low-level waste regulatory program. In developing this program, however, it is not considering the possibility of using DOE land burial sites. NRC officials told us that DOE sites were not considered since they did not want to place these sites in competition with commercial land burial operations. However, because of the recent burial restriction on Barnwell and lack of assurance that a similar situation will not occur at the western burial sites, NRC has requested DOE for the use of their burial facilities as backups to commercial sites in accepting commercial wastes.

The use of these burial sites as backup facilities appears to be a more reasonable alternative than opening new burial lands. However, there are some questions which first need to be addressed in considering this option. First, the jurisdictional question: NRC does not currently license DOE burial sites. Second, the question of regionalization: do DOE's eastern sites have the burial capacity to handle waste from the powerplants in the eastern United States?

In March 1978 DOE completed a task force review on nuclear waste management. One of the study's recommendations called for DOE ownership and management of both commercial

and Federal low-level waste burial grounds, with NRC having regulatory authority over both. According to one DOE official, the study's recommendations will be reviewed by other Federal agencies, Congress, States, industry, and the public before being incorporated into proposed legislation for submission to the Congress early in the 96th Congress.

SOCIAL AND TECHNICAL QUESTIONS
COULD DELAY NRC'S PROGRAM

When NRC developed its low-level waste management plan, it decided not to license any new burial grounds until it completed the development of its regulatory program in 1980-1981. However, NRC stated that it would complete any licensing actions dealing with the expansion of existing sites. The Sheffield, Illinois, burial site operator had applied for an expansion of its facility; however, we learned from NRC officials that it is unlikely a decision would be made on the Sheffield site in the near future.

This licensing action has already begun to face opposition by the public and State Government agencies in Illinois as well as national intervenor groups. Opposition to this action centers on two issues. First, NRC had failed to make a determination on the license renewal application filed by the operator 9 years ago. Opponents have charged this would be in violation of the National Environmental Policy Act and NRC's own regulations which require preparation of an environmental impact statement. Second, opponents argue that any licensing action prior to completion of NRC's low-level waste regulatory program is premature.

NRC estimates that after completion of its regulatory program in 1980-1981, it will take approximately 3 years to perform site reviews and license new burial grounds. NRC believes this is sufficient time to analyze the detailed technical information necessary for confirming site suitability and to carry out its licensing responsibilities.

In a 1976 report ^{1/} we stated that it could take 2 to 5 years to perform the necessary technical studies before decisions can be made that a site is suitable for waste disposal.

In addition, it could take at least 1-1/2 years to license a new burial site. Using these time periods it appears

^{1/}"Improvements Needed in the Land Disposal of Radioactive Wastes--A Problem of Centuries" (RED-76-54, January 12, 1976).

unlikely that new burial grounds will become available by 1984-1988, or at just about the same time the current burial system starts to run out of space. By this time, regional burial grounds may already face shortages or be closed.

CHAPTER 4

CONCLUSIONS AND RECOMMENDATIONS

Waste treatment systems have experienced operational problems because of their own design deficiencies or as a result of larger than anticipated waste quantities being generated. Because NRC is not placing enough emphasis on waste treatment system performance, operability, operator training, and management control, during its licensing and inspection efforts, the potential for unnecessary exposures to nuclear plant workers and unplanned releases to the environment has increased.

Although industry and NRC are taking actions to correct these inadequacies, the results of their efforts will not be known unless NRC establishes a data base for monitoring the performance and reliability of waste treatment systems in operation. This data base could be used in developing guides on which generic systems and their configuration within a given nuclear powerplant are the best from a release, exposure, and volume viewpoint. Such a data base would also provide NRC with a useful management tool for assuring itself that its actions are keeping releases and exposures to "as low as is reasonably achievable" levels.

NRC's licensing staff is primarily concerned with insuring that radiation levels in liquid and gaseous wastes are below Federal limits. When NRC's new requirements for solidifying all wastes being shipped to land burial grounds are implemented, waste volumes could increase.

NRC is not requiring plants to indicate how they plan to reduce waste volumes. Industry is initiating some actions to deal with handling larger waste volumes and for assuring that plant operations do not result in the generation of unnecessary wastes. Some new plants are applying available technology to further reduce waste volumes. However, other new plants are not addressing ways of further reducing waste volumes. Clearly, more can and should be done to reduce waste volumes.

Because the disposal of radioactive waste is a social and national issue, we believe NRC should take the lead by adopting a Federal policy to reduce waste volumes. In this respect, NRC has started an ambitious effort aimed at providing guidance for selecting new burial grounds and disposal alternatives for low-level radioactive waste. Due to the present burial restriction on Barnwell and lack of assurance that a similar situation will not occur at western disposal sites, NRC has requested DOE for the use of their land burial sites as backup

facilities. The use of these burial sites appears to be a more reasonable alternative than opening new burial lands.

RECOMMENDATIONS

We recommend that the Chairman, Nuclear Regulatory Commission:

- Require that waste treatment system performance, operability, operator training, and management control be assessed to a greater extent than is currently being done during its licensing and inspection efforts.
- Establish a system for monitoring the performance and reliability of waste treatment systems in operation to insure that poor performing systems are not used in new plants and that releases and exposures are kept to "as low as is reasonably achievable" levels. To a greater extent NRC inspectors should be required to report to licensing officials on poor performance found in waste treatment systems. Licensing officials should consider this information during their review of new powerplant waste treatment systems.
- Existing procedures should be revised to insure that major changes to waste treatment systems are reviewed and approved by NRC in a timely manner before being implemented by the utilities.
- Determine on a priority basis the safety of the contractor mobile waste solidification system currently being used.
- Consider the chemical composition of low-level waste when approving the design of waste systems and evaluate their effects on the performance of waste treatment systems in operation.
- Undertake a study aimed at minimizing waste volumes being generated at existing plants and adopt a policy on volume reduction requiring operating plants and those undergoing licensing review to evaluate the costs and benefits of adopting volume reduction techniques and in reducing waste volumes.
- Pursue on a priority basis the option of using DOE burial sites as backups to commercial sites in accepting commercial low-level wastes.