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Western New York
Nuclear Service Center Study

Final Report for Public Comment

The legislation authorizing this report provides that neither it nor anything in it shall be construed as intending to commit the Federal Government to any new assistance or participation in the Center or as relieving any party "of any duties or responsibilities under any law, regulation, or contract to provide for the safe storage of nuclear waste." Further, this report is not intended to address the question of what, if any, additional legal authority would be needed to implement any recommended course of action.

November 1978

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

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1. INTRODUCTION

The Western New York Nuclear Service Center (WNYNSC) is located in a rural area about 30 miles southeast of Buffalo. Within five miles of the Center are located the small communities of West Valley, Riceville, Ashford Hollow and the village of Springville. The Center's facilities include the only commercial nuclear fuel reprocessing[t] plant that ever operated in the U.S., a fuel receiving and storage facility, burial areas for solid radioactive wastes, and tanks containing liquid high-level radioactive wastes. Nuclear Fuel Services, Inc. (NFS), commercial operator of the Center, reprocessed fuel there from 1966 to 1972. The plant is now being maintained in a shutdown condition. The facility is located on land leased by NFS from New York State. The terms of the contract between the State and NFS require the State to assume responsibility for the facilities and the wastes (when the lease expires) at the end of 1980. The State of New York requested, in November 1976, that the Federal Government take over the site.

The Fiscal Year 1978 Authorization Act instructed the Department of Energy (DOE) to carry out this study of the options for the future of the Western New York Nuclear Service Center (the Center) at West Valley, New York.1/ DOE was also directed to recommend an allocation of existing and future responsibilities for the Center among the Federal Government, the State of New York, and present industrial participants.

The authorizing legislation directed DOE to conduct informational public hearings prior to the completion of the study. DOE was also directed to make the study available for public comment 90 days prior to its submission to the Congress, and to submit all comments with the study report. An effort was made to make this Summary Report understandable to readers without specialized background. Technical background material is presented in a separate Companion Report.

In addition to providing some historical perspective and the logic and recommendations for the allocation of responsibilities, this report presents a description, potential impacts, and estimated costs of options for the future of the WNYNSC. Since regulations and criteria regarding the final disposition of radioactive wastes and radioactively contaminated structures are still evolving, it is not possible to define the minimum actions required for the final disposition of the WNYNSC. Nor is it possible, within the constraints of this study, to examine all of the possible options for the future of the Center. Therefore, only some of the potentially viable

1/ Public Law 95-238, Section 105. The text of Section 105 is given in full in Appendix A.

t - All items marked with a "t" can be found in the Glossary, Appendix B of this report.

options are considered here. The technical options were chosen to attempt to define the potential limits, both high and low, of the financial responsibilities associated with the WNYNSC. Only options which DOE believes could eventually be executed in a safe manner were considered. The cost estimates provided should not be viewed as firm upper or lower limits. Although the cost estimates are based only on preliminarily defined tasks and associated criteria, they are believed to provide a reasonable assessment of the relative magnitudes of the various options.

1.1 HISTORY

A stated purpose of the Atomic Energy Act of 1954 was to promote "widespread participation in the development and utilization of atomic energy for peaceful purposes." The Atomic Energy Commission (AEC) actively encouraged private industry to enter the field of nuclear power. By the end of 1955, the AEC concluded agreements for the first few demonstration power reactors.

In 1954, the AEC began a program to encourage private participation in the reprocessing of irradiated nuclear fuel as part of its program to commercialize the entire nuclear fuel cycle. To have commercial reprocessing services available for the first irradiated fuel in 1961, the AEC offered to make available the reprocessing technology developed for the defense program.

In 1959, New York State's interest in attracting atomic development culminated in the formation of the Office of Atomic Development (OAD) as an independent agency responsible for coordination of atomic regulatory and development functions within the State. To encourage nuclear development, the OAD acquired the West Valley site in 1961, which became designated the Western New York Nuclear Service Center (WNYNSC). The purpose of the Center was to store nuclear fuels and radioactive wastes and to be available for related industrial development.

The Davison Chemical Co. was sufficiently encouraged by the developments in the late 1950's to consider the feasibility of constructing a reprocessing facility. In 1961, Davison expressed interest in operating the WNYNSC. In January 1962, Davison outlined its plans to the AEC for constructing a private reprocessing plant. To pursue the reprocessing venture, Davison set up Nuclear Fuel Services, Inc. (NFS), whose stock was owned by the W. R. Grace Co. (78%) and American Machine and Foundry (22%). NFS, in its proposal, indicated its willingness to provide and maintain storage for a limited period of time for the high-level liquid wastes (HLLW)[t] resulting from the reprocessing operations. Subsequently, the wastes would become the responsibility of the AEC. NFS also said it was willing to collect and return to the AEC an amount calculated to provide the estimated full costs for perpetual storage at the point of turnover. NFS was simultaneously negotiating to make New York State responsible for perpetual care of the wastes. The proposed, and eventually approved, method of waste disposition was to store them in liquid form in underground storage tanks, similar to the method being used at AEC production facilities.

During the following years, a complex series of negotiations took place among the AEC, NFS, and OAD. In 1962, the OAD became the New York Atomic Research and Development Authority (NYARDA). These negotiations culminated in four contractual agreements. NFS entered into a contract with the AEC under which the AEC would provide a baseload[t] for the first five years of the reprocessing plant operation. NFS also entered into three contracts with NYARDA: (1) a lease for the WNYNSC; (2) a facilities contract under which NFS would build storage facilities for nuclear fuel and radioactive wastes; and (3) a waste storage agreement which provided the terms for NFS to maintain the wastes for a period of time, limited by the duration of the lease, thereafter, turning them over to NYARDA along with a fund for perpetual care. New York State through NYARDA provided assurance (as amendment No. 1 to the Application for License) to the Federal Government that the State would be responsible for the wastes in perpetuity.

In May 1963, the AEC issued a permit authorizing construction of the NFS plant. Construction was completed in early 1966, and on April 19 of that year, the AEC issued a license to NFS for operation of the first commercial nuclear fuel reprocessing plant.

On November 14, 1970, the AEC amended its regulations (10 CFR 50, Appendix F) to require that high-level liquid wastes generated at licensed fuel reprocessing facilities be solidified within five years after separation, and shipped to a Federal repository within ten years after separation. The existing NFS wastes were specifically excepted from these regulations pending a future rule-making proceeding by the AEC. The Nuclear Regulatory Commission (NRC), since 1974 the successor to the regulatory arm of the AEC, is still in the process of making this rule.

From 1966 to 1972, about 640 metric tons (MT)[t] of nuclear fuel were processed at the WNYNSC. Approximately 380 MT of AEC's production reactor[t] and 100 MT of commercial reactor fuel were supplied under the baseload contract. The remainder was supplied directly to NFS by public utilities. In 1972, the plant was shut down to expand its capabilities and to make modifications to reduce radioactive effluents and radiation exposure levels to plant personnel. At the time, NFS estimated this modification program would cost about $15 million and take two years to complete.

The proposed modification program involved a significant alteration, as determined by the AEC, of a licensed facility and, therefore, required a complete licensing review. This included review of the plant's ability to mitigate the consequences of natural phenomena (earthquakes and tornadoes). When the NFS facilities were constructed, the need to withstand certain natural phenomena was recognized and the facilities were built to the specifications of the Uniform Building Code for earthquake zone 3. These were construction specifications which did not require that the ability of the plant to withstand a certain magnitude of earthquake be demonstrated. However, during the licensing review, the AEC stipulated that new facilities must also be able to withstand the effects of the highest magnitude tornado that can be expected to occur at least once in ten million years and the highest magnitude earthquake that can be expected to occur at

least once in one million years. AEC also requested that NFS assess the capability of the existing structures to withstand these phenomena. By 1976, NFS judged that over $600 million would be required to complete the proposed modification program if these and other criteria, actively being considered at the time, were imposed.

In April 1976, NFS notified the New York State Energy Research and Development Authority (NYSERDA), the successor to NYARDA, of its intention to exercise its right under the Waste Storage Agreement to surrender the responsibility for all wastes at the WNYNSC to NYSERDA. On September 22, 1976, NFS announced its decision to withdraw from the nuclear fuel reprocessing business, citing rising costs and uncertain regulatory requirements as key factors. The biggest reason was stated to be a "drastic increase" in the seismic criteria for the plant. On November 30, 1976, NYSERDA advised the Federal Government that ownership of the WNYNSC and responsibility for its contents should, in their opinion, be transferred to the Energy Research and Development Administration.

This study is intended as a first step in reconciling the problems of responsibilities at the WNYNSC. For the present, NFS continues to be responsible for the site under the terms of the lease, and maintains a staff of more than 50 people for this purpose. NFS (now a wholly owned subsidiary of Getty Oil) intends to remain at the site through December 1980, unless they are relieved of responsibility sooner.

1.2 SUMMARY DESCRIPTION AND STATUS OF SITE AND FACILITIES

The WNYNSC occupies approximately 3345 acres. Less than 250 acres of the site have been developed for the reprocessing plant and associated facilities.

The existing facilities at the site include: (a) Spent Fuel Receiving and Storage Facility - this is a water basin (approximately 75 feet wide, 90 feet long, and 29 feet deep) with associated cranes and decontamination facilities. This facility is currently operable and is filled to about 2/3 of capacity with 750 spent fuel assemblies. (b) Reprocessing Plant - a chemical processing facility encompassing approximately 80,000 square feet of floor space. The plant is being maintained in a shutdown condition. (c) High-Level Liquid Waste Storage Facility - this facility consists of two 750,000-gallon alkaline waste storage tanks, one contains about 560,000 gallons of high-level liquid wastes and the other serves as a spare; two 15,000-gallon acidic waste storage tanks, one of which contains about 12,000 gallons of waste solution, the other serves as a spare; and associated ventilation, surveillance and heat transfer systems. There are no indications that the tanks at NFS have ever leaked. Their design life is 50 years, and corrosion sampling to date indicates corrosion levels far below the design allowance. (d) NRC-Licensed Waste Burial Ground - this consists of approximately seven acres of the site. Approximately 139,000 cubic feet of spent fuel

hardware and other solid wastes are buried up to 50 feet deep in these areas. Also located in this burial ground are a number of ruptured fuel assemblies encased in concrete. This facility was licensed by the AEC to accept waste generated from the reprocessing operations (primarily spent fuel hardware) and is currently being used to dispose of the small amounts of wastes generated at the plant. (e) New York State-Licensed Waste Burial Grounds - this consists of approximately 22 acres containing about 2.4 million cubic feet of contaminated wastes. About 23% of these wastes were generated at the reprocessing plant, the remainder came from schools, hospitals, pharmaceutical companies, research institutions, waste disposal companies, nuclear reactors and Federal installations. Operation of these burial grounds was ceased in 1975, primarily because of overflow from some of the older trenches. Measures have been taken to correct the problem.

NRC issued an "Interim Safety Evaluation" in August 1977 which concludes that "because of the passive nature of the present activities in a plant designed for operation with a much greater risk potential there is no undue risk to the health and safety of the public or to the employees."

1.3 SUMMARY OF WEST VALLEY ISSUES AS VIEWED BY CONCERNED PARTIES

Local Governments

NFS is an important source of local tax revenues. Currently NFS contributes about 17 percent of the school budget and about 35 percent of the Town of Ashford's budget. Cattaraugus County, in which NFS is located, also taxes the facility, but NFS's contribution to that county's total budget is small. When the WNYNSC was constructed, the State and NFS emphasized the economic aspects of the project. When the WNYNSC became operational about half of the jobs went to Cattaraugus County residents. However, employment in the community never grew to the levels that were predicted. When the operations ceased, people were laid off. The remaining 50 jobs are viewed locally as important because of the high unemployment rate.

Through the public interactions which have occurred in the past year, some people have expressed satisfaction in the plant's ability to protect health and safety while others have expressed concern relative to: (1) radioactive pollution of Cattaraugus Creek (which flows into Lake Erie, the primary water source for Erie County and others); (2) exposure of workers to radiation; (3) lack of sufficient evaluation of the effects of radiation exposure on the health of the NFS workers; and (4) lack of an accepted method for disposing of radioactive wastes.

The State of New York

Through its Energy Research and Development Agency and supported by Congressional representatives, the State has encouraged a Federal responsibility for the site.

Nuclear Fuel Services, Inc.

H. W. Brook, Vice President of NFS, transmitted a document on May 5, 1978, which explained NFS's position with respect to the disposition of the WNYNSC. The following excerpts are provided:

"The incorporators [of NFS] committed $8,000,000 to the venture. The remainder of the projected $32,000,000 needed to construct and commence initial operation of the reprocessing plant was raised through debt financing and state and utility funding. . .

"NFS anticipated a profitable return on its investment. . . [However,] NFS' expectation of a reasonable profit was far from realized. On the contrary, NFS lost many millions of dollars operating and trying to operate the West Valley plant in a changing regulatory environment. . .

"Only the Federal Government realized any of its expectations . . If legal arguments alone will not serve to transfer West Valley to the Federal Government, equitable and compassionate considerations should. The ebb and flow of Federal policy created the West Valley project and, in turn, destroyed it. It is now time for the Federal Government to face the implications of its actions. The other parties have paid enough."

In addition, NFS believes that beneficial use of existing facilities is possible and desirable.

Congressional Review

The General Accounting Office (GAO) was requested by Congress to study the issues related to the closing of the NFS facility. The GAO in their report (EMD-77-27, March 8, 1977) recommended that the Nuclear Regulatory Commission (NRC) develop criteria for handling the waste and decommissioning the site, and that NRC and DOE develop a policy of Federal assistance to New York for the site. Hearings were held on "Nuclear Waste Disposal Costs (West Valley)" before the Subcommittee on Environment, Energy, and Natural Resources, Committee on Government Operations, House of Representatives early in 1977. Federal and State officials, Congressmen, and NFS representatives presented testimony. A report based on these hearings was issued (House Report No. 95-755, October 26, 1977). It was found that "the safety of the public was not in jeopardy" but assurances of safe conditions in the future were not possible. The GAO and the Committee found that legal responsibility for the site finally rests with the State of New York because of prior contractual arrangements. Additional hearings were held in June 1977 before the Subcommittee on the Environment and the Atmosphere (Chaired by George E. Brown, Jr.), Committee on Science and Technology. The first day focused on the West Valley plant in order to examine the technical and institutional problems involved in this particular example of possible future decommissioning.

A notable suggestion made by Richard Lester of the Rockefeller Foundation was that the questions of who is to pay and who is to manage the wastes at West Valley should be resolved separately. It was recognized that the West Valley plant presents a unique problem. The report of these hearings which was issued (House Report No. 98-512, February 1978) presented as a finding that there is a need for a technical assessment of alternative decontamination and decommissioning (D&D) methods and for more precise estimates of their costs. Associated with this is a need to develop criteria for selection of the alternatives for a specific site.

1.4 SUMMARY OF PUBLIC INTERACTIONS

Initial Meetings With the Public[2/]

Two meetings were held to discuss options for the Western New York Nuclear Service Center. The objective of the first meeting held on March 18, 1978, and co-sponsored by the DOE and Congressman Stanley Lundine in West Valley, New York, was to obtain public input on the scope and basic approach of the study. A second meeting was held by Argonne National Laboratory (ANL) on June 14 and 15, 1978, in Hamburg, New York, to follow up on specific technical comments and concerns expressed at the March 18 meeting. The two meetings differed in format. The first was essentially an open forum; in the second meeting, persons met in small groups to discuss subjects of their choice with members of ANL's scientific and engineering staff.

During the first meeting, brief presentations were made by local residents and other members of the general public, union officials, representatives of environmental organizations, and officials of local, county, State and Federal Governments. During the second meeting, private citizens and representatives of local governments and businesses, labor unions, industry, and environmental organizations presented their views and discussed technical issues with ANL personnel. The group discussions could be viewed by other members of the public by closed-circuit TV and were also videotaped.

The views presented at the meetings were diverse. Concern was expressed about the health effects to the public and workers from exposure to radioactivity and about potential contamination of water supplies. Additionally, concern was expressed that the site would be used as a permanent waste repository. Some people expressed the desire that the WNYNSC site be completely decontaminated and decommissioned. Others suggested alternative uses of the facilities, including the continued use of the NYS-licensed waste burial grounds, the reactivation of the fuel reprocessing facilities, and use of the facilities for Federal research and development (R&D). Economic

2/ Transcript and additional written comments concerning the first meeting are printed in "Public Meeting, Western New York Nuclear Service Center Options Study, March 18, 1978, West Valley, New York," U.S. Department of Energy, CONF-780323, April 1978.

losses (jobs and taxes) were a local concern. Views on the allocation of responsibilities for the Center varied from making the Federal Government solely responsible, to dividing the responsibility among the involved parties. Many of the speakers at the first meeting and most of the people participating in the second meeting thought that substantive public input would be helpful in future decisionmaking associated with establishing a viable option for the Center.

Suggestions made at these meetings to include the study of future nonnuclear usage of the site and of plant dismantlement are incorporated in this report.

West Valley Tank Decontamination and Decommissioning Task Group

In an effort to assist the establishment of appropriate criteria for decontamination and decommissioning, as well as to increase a cooperative spirit between the public and State and Federal organizations, the West Valley Tank Decontamination and Decommissioning Task Group was formed. The Group explored criteria important to decontaminating and decommissioning the WNYNSC, with their primary mission being the high-level waste tanks. The Group was co-chaired by DOE and the New York State Attorney General's Office. The first meeting was held in May 1978 and the final one in August 1978. The recommendations of this task group which are contained in their report are presented below. Complete explanations of their recommended criteria and Procedural Diagrams are contained in their report which is included in its entirety in the Companion Report.

West Valley Tank Decontamination and Decommissioning
Task Group Recommendations

Based on study of the radioactive materials present at the West Valley site, and consideration of appropriate criteria and the procedures for utilization of them, the Task Group makes the following recommendations:

1. Our strongest recommendation, which we intend to carry the highest priority and urgency, is that development of technology for immobilizing the high-level liquid wastes at West Valley be started immediately and work begin as soon as the technology is developed. We have determined this recommendation through our Urgent Action Consideration. However, action taken under this criterion must not be construed to qualify as completion of the work needed to properly decommission the facility.

2. We recommend that the Criteria stated by the Task Group be adopted and used to guide all decisions regarding decontamination and decommissioning of the West Valley site.

3. We recommend that a time limit of 5 years from January 1, 1979, be established to provide an adequate period of time to carry out all studies needed to collect and analyze the baseline data for the site for all radioactive portions of the West Valley site. This recommendation is not meant to preclude the possibility of work proceeding in areas where no further studies are needed. It is our intention that work be started in all areas as soon as all necessary data is collected and analyzed. It is also our intention that all studies be instituted as soon as the need for them is identified.

4. We recommend that the decisionmaking process for disposition options proceed expeditiously as soon as the necessary information is obtained.

5. We recommend that the Procedural Diagram for Utilization of Criteria be adopted and implemented.

6. We recommend that all nuclear materials be removed from the site and be placed in an appropriate storage facility consistent with the Task Group principles as soon as the risk assessment supports such action. We recommend that a permanent repository be located and constructed as soon as possible in order to meet our goal of unrestricted access to the site.

7. We recommend that adequate funds be provided such that short-term and long-term risks can be determined with confidence and minimized.

8. We recommend that continued public input be encouraged and that independent interdisciplinary committees be utilized to review all key decisions about waste management at the West Valley site.

9. We recommend that restricted utilization of the site within the security fence, monitoring for radionuclide migration, and maintenance of all containment systems be continued until the site has been shown to meet our numerical nonrestricted utilization criteria. Restricted access areas must not contain any high-consequence radioactive material that is highly mobile or easily accessible.

10. We recommend that a hydrogeologic study of the high-level solid waste NRC-licensed burial ground be carried out to determine the probability and extent of migration of these wastes into the environment.

11. We recommend that a decontamination and decommissioning plan for the process building and high-level waste tanks (after actions are taken under the Urgent Action Criterion) be developed immediately.

Letters and Responses

This study has been the subject of substantial interest throughout its duration. During the period following the March 18, 1978, public meeting, over 100 responses to specific and general inquiries were sent by the DOE to concerned persons, organizations, and State and Congressional officials.

2. TECHNICAL OPTIONS FOR THE FUTURE OF THE WNYNSC FACILITIES

The technical options were chosen to attempt to define the potential limits, both high and low, of the financial responsibilities associated with the WNYNSC. Summary descriptions and estimates of radiological impact, cost and schedule for implementing these technical options are presented in this section. The options are grouped into three categories:

1. Options for decontamination, decommissioning and waste disposal
2. Options for continued nuclear use of existing facilities, and
3. Options for nonnuclear use of the site

While there certainly are other options, available resources and time limited the scope of this study. A number of potentially viable options are described and presented in such a way that a large number of scenarios for the future of the Center can be assembled and examined. There is an existing technological base for all options presented.

Specific regulatory criteria applicable to these options are just now evolving. NRC is developing a general waste classification[3/] system using pathway analysis techniques. This system has recently been applied to the NYS-Licensed Burial Grounds at the Center. In addition, pathway methodology was applied to the high-level liquid wastes at the Center.[4/] The purpose of these efforts was to test the classification system by application to an existing burial ground and to help in establishing decontamination and decommissioning criteria for the high-level liquid waste tanks. This system has not been applied to the Reprocessing building or other areas of the site which may require decontamination and decommissioning. It is not definite that any of the options as they are described will be consistent with the developing criteria. However, implementation of the options could progress in parallel with criteria development and serve as input to the criteria development process. While this is not the most desirable method, it may be necessary.

The costs are not based on detailed designs but are best conceptual estimates using available information and experience. The radiological impacts are estimates of what might be experienced during operations. Accident analyses were not within the scope of this study.

The facilities and wastes are discussed as separate, independent entities; however, interdependence is inherent in some of the options. For example, one of the options for the disposal of high-level liquid waste requires that the waste first be transformed into a stable solid form; this transformation could be carried out in the reprocessing plant. Thus, the reprocessing plant could not be decommissioned before this option for high-level liquid waste is completed.

3/ NUREG-0456 dated June 1978

4/ "Compilation of the Radioactive Waste Disposal Classification System Data Base," FBDU-247-01 dated September 1978

2.1 HEALTH, SAFETY AND ENVIRONMENTAL ASPECTS

The U.S. Nuclear Regulatory Commission (NRC) is responsible for protecting the health and safety of the general public through the regulation of nuclear industry activities. With the exception of the State licensed burial grounds, all nuclear facilities at the WNYNSC are subject to regulation by the NRC. In the case of the New York State licensed burial grounds, regulation authority has been delegated to the State. (State regulations are at least as strict as Federal regulations.)

In August 1977, the NRC staff released an evaluation of the safety of the present activities at the WNYNSC ("Interim Safety Evaluation I," Docket No. 50-201). This report considers the management of radioactive wastes at the site, the storage of spent fuel, the surveillance of the reprocessing plant and present administrative requirements. The conclusions of this report include the following statement: "The staff concludes that because of the passive nature of the present activities in a plant designed for operation with a much greater risk potential there is no undue risk to the public or to employees."

NFS has continuously monitored the West Valley site since 1966 and has issued semi-annual reports on the level of radioactivity in water, air, deer, fish, and silt in the surrounding area. The Cattaraugus County Health Department, the New York State Department of Environmental Conservation and the U.S. Environmental Protection Agency have also monitored the area for any significant changes in radioactivity. Since the plant startup in 1966, monitoring of the environment by NFS and cognizant government agencies has shown that exposures to radiation of the general population in the vicinity of the plant are not significantly different from those received in other portions of the State.

Many radiological health and safety studies have been conducted through Government agencies, university grants, and other sources. Knowledge gained through these studies provides a base of information on which general engineering judgements pertaining to the safety of options being considered for West Valley can be made. A listing of references which discuss health effects of radiation can be found as a supplement to the detailed Companion Report.

Radiological impacts of normal operations associated with the D&D options specific to the West Valley facility were explored in this Study. The DOE's Division of Biological and Environmental Research is planning to study trends in diseases and causes of death in the area surrounding the West Valley site to look for any effects from the WNYNSC operation. This study will be a follow-up in some respects to the 1977 New York State Health Department Study, "Summary of Selected

Health Statistics for Counties with Nuclear Facilities (1960-1975)." This study concluded that "No statistically significant deviations in rates between counties with nuclear facilities and those without nuclear facilities were observed for any of the selected health characteristics under study." The health characteristics selected for this study were infant deaths, fetal deaths, premature births, congenital malformation births, infant deaths from congenital malformations, and deaths due to malignant neoplasms.

Detailed health, safety and environmental evaluations specific to options for the future disposition of the site shall be undertaken before irrevocable decisions are made.

Decontamination, Decommissioning and Waste Disposal Options

The permanent disposal of radioactive wastes and the ultimate decommissioning of radioactive facilities have been receiving increased attention in the past few years. This attention has resulted in a considerable amount of discussion of how safe is safe enough, what are acceptable levels of decontamination, what are acceptable methods of decommissioning radioactive facilities, and what are acceptable methods for final disposal of radioactive wastes. To achieve an acceptable final disposition, two decommissioning and waste disposal options were considered for each area of the site. These options represent, on one end, a minimum amount of physical alteration and resulting costs, and on the other end, the maximum amount of physical alteration and resulting costs.

In general, the minimum alteration (low) options include continued storage of radioactive materials at the WNYNSC with continued restrictions on the use of some of the site. The maximum alteration (high) options may allow unrestricted use of the site. Before a decision is made to implement any option, the benefits and risks of each option will need to be examined. For example, the complete dismantlement (high) option would entail the risk of exposure to workers removing the waste, to the public located along transportation routes to the waste repository, and to the repository workers. The protective storage (low) option would entail risks associated with confining the waste at West Valley and continued maintenance and surveillance of the site.

Continued Nuclear-Related Use of the Site

In accord with past practice, if the reprocessing plant is put to some future nuclear use, the entire site would remain restricted in order to maintain the protective control around the facilities.

Should only the burial grounds and/or the spent fuel storage pool continue to be used, a large portion of the 3300-acre site may be returned to unrestricted use.

Since the facilities have already been used for nuclear activities, any environmental costs of final disposition of the WNYNSC would probably not change significantly because of additional use. There would be some environmental costs associated with continued use. Any nuclear-related continued use of the center would have to comply with appropriate radiation release criteria.

Nonnuclear Alternatives for Future Use of the Site

The nonnuclear alternatives considered in this report would entail ecological impacts which are similar to any new industrial, research, agricultural, or recreational use. These include land use, construction, drainage erosion and traffic pattern impacts.

If the ecological park concept is pursued, substantial improvement of the understanding of environmental processes and environmental impacts from nuclear or nonnuclear activities may well result. This knowledge could lead to positive environmental effects both at this site and elsewhere.

2.2 OPTIONS FOR DECONTAMINATION, DECOMMISSIONING AND WASTE DISPOSAL

The objective of waste management planning is to provide reasonable assurance that existing and future nuclear waste in whatever form from both military and civilian activities can be adequately isolated from the biosphere.[t]

Table 2-1 summarizes the estimates of cost, radiological exposure and time to implement each of the options.

The estimated time for completing the options does not specifically allow for licensing. Although it is assumed that the licensing time required depends on the complexity of the option being considered, it is believed that licensing can substantially be accomplished within the schedules shown provided that (1) NRC can deploy sufficient resources, (2) good pre-application communications between the NRC and license applicant take place, and (3) lengthy appeals following a licensing decision can be avoided.

2.2.1 High-Level Liquid Wastes (HLLW)

There are about 560,000 gallons of neutralized[t] radioactive wastes from the reprocessing of uranium[t]-based reactor fuels stored in an underground carbon steel tank at the West Valley site. Approximately another 12,000 gallons of acidic radioactive liquid wastes are contained in a separate underground tank fabricated from stainless steel; this acidic waste was produced during the processing of an experimental thorium[t]-based fuel. The composition of the material in the tanks based on records and analyses indicate that the larger tank contains 39 million curies[t], while

Table 2-1

Waste Management Options[E] Impact Summary
for the Western New York Nuclear Service Center

Site Area	Option	One Time Cost to Implement[J] (millions 1978$)	Recurring Annual Costs[J][L] (thousands 1978$)	One Time Radiological Exposure[B] (man-rem) Occupational	Population[C]	Duration[D] of Option (years)
High-Level Liquid Wastes	In-tank Solidification[A]	21	750/70[I]	260	less than 0.5	5[M]
	Immobilization in Glass[A]	130[K]	0	400[F]	14	9[G]
High-Level Waste Tanks	On-site Stabilization	3.3	25	40	less than 0.5	1[M]
	Dismantlement	20[K]	0	240[F]	6	2
NRC-Licensed Burial Area	Extended Care	0.15	35	1	less than 0.5	0.1[M]
	Exhumation	340[K]	0	760[F]	280	10
NYS-Licensed Burial Area	Extended Care	0.11	40	less than 0.5	less than 0.5	0.1[M]
	Exhumation	570[K]	0	1000[F]	780	10
Plant & Ancillary Facilities	Protective Storage	17[H]	480	320[F]	1	4[M]
	Dismantlement	46[K][H]	0	570[F]	18	6

A) includes waste retrieval
B) resulting from waste handling and transportation only, projected exposures resulting from final disposition not included; population dose to the 2 million people living within 50 miles of the Center from natural and medical sources is 400,000 man-rem each year.
C) largest component due to transportation
D) from construction start
E) these options represent the potential low and high limit of financial and radiological impact of what might be done at the WNYNSC. They are not a complete list of what could be done.
F) exposures during final waste disposal not included
G) does not include decommissioning of immobilization equipment
H) costs of shipping spent fuel to another location not included (assumed responsibility of owner)
I) $750,000/yr until about 1996, $70,000/yr after entombment
J) costs rounded to two significant figures
K) totals associated for these options include all costs for removal, transportation and a one-time repository fee
L) includes costs for annual maintenance and surveillance actions at the WNYNSC only.
M) these options require a long term commitment not included in these time estimates.

the smaller tank has 2 million curies. The heat generated as a by-product of the radioactivity maintains the larger tank at about 190°F; the waste in the other tank is kept at 100°F to 120°F by means of external cooling. The major contributors to the radioactivity in the waste tanks at the WNYNSC are the fission products[t] cesium[t] and strontium,[t] which are by-products of the nuclear fission[t] process.

The fuel reprocessing scheme used at the WNYNSC produced an acidic liquid high-level waste which was neutralized prior to storage in the carbon steel tank to reduce corrosion. This neutralization process, which is also in use at DOE's Hanford and Savannah River installations, resulted in the separation of the waste in this tank into two layers: (1) an upper liquid portion, containing most of the radioactive cesium, and (2) a denser solids-containing portion (usually referred to as sludge)[t] which contains most of the radioactive strontium, other fission products, and small amounts of long-lived elements. Long-lived elements provide less than one-tenth of one percent of the total curies of radioactivity in this tank.

The "sludge" present in the larger tank has been estimated to amount to as much as 124,000 gallons. The term "sludge" may be a misnomer. The West Valley material is probably not as viscous as typical neutralized defense wastes. The West Valley sludge consists of about 15,000 gallons of solid material, mixed with about 109,000 gallons of liquid. This estimate is based on records of what was put into the tank. Sampling prior to removing wastes from the tank will confirm the composition and physical characteristics.

The thorium-based waste was not neutralized and is stored in a 15,000-gallon stainless steel tank which is not expected to contain sludge.

Two options for disposal of the high-level liquid wastes are presented below; in-tank solidification and immobilization in glass. A third option, shale fracture,[t] is presented in detail in the Companion Report. It was the original low option for the high-level wastes but evaluation showed that it appeared to involve greater impacts than in-tank solidification. Decontamination and decommissioning of the tanks are discussed in the next section. These processes all have the same initial phase, namely the retrieval of the high-level liquid wastes from the storage tanks.

2.2.1.1. Retrieval of High-Level Liquid Wastes From Tanks

DESCRIPTION: Removal of the acidic wastes from the small tank is not expected to be a problem. However, removal of the neutralized wastes

will be complicated by the existence of the sludge layer, as well as by the roof restraint and heat transfer grid structure in the bottom of the tank. There are only three access ports in the large tank adequate for introducing waste retrieval equipment.

Two similar waste retrieval processes were examined, one with tank cleaning, called Process A and one without tank cleaning, called Process B. The in-tank solidification option does not require tank cleaning.

Process A consists of slurrying the contents of the large (carbon steel) tank and periodically transferring the resulting slurry to a mixing tank. The empty waste tank would then be washed with oxalic acid[t] to dissolve any remaining solid material. Less than 1 percent of the original sludge is expected to remain after this process. Using a submersible pump, the contents of the small (stainless steel) tank would be transferred to the mixing tank as would the wash solution.

Process B would be similar to process A except that the tanks would not be washed with oxalic acid. Also, the contents of the small tank would be neutralized in process B.

	Costs (Millions of $)		Radiological Impacts (man-rem)[t]		Time to Complete
	Capital	Annual	Occupational	Population	
Process A	12	Not	120	less than 0.5	2 yrs
Process B	10	Applicable	120	less than 0.5	2 yrs

STATUS OF TECHNOLOGY: Techniques for removing sludge from radioactive waste tanks have been developed and used at DOE's Hanford and Savannah River installations since the early 1950's. The first full-scale tank cleaning demonstration was initiated at Savannah River in 1978 and should be completed in 1979. Experience gained during this effort will be applicable at West Valley.

Specific work activities for waste retrieval and tank cleaning include: determination of the physical properties of the waste, adaptation of equipment for use in the WNYNSC tank and some investigation of effective chemical washes for the West Valley wastes. Included in the costs shown above is over $1 million to perform these studies.

2.2.1.2 Disposal of High-Level Liquid Wastes (HLLW)

OPTION: In-Tank Solidification of High-Level Liquid Wastes

DESCRIPTION: A low cost alternative for disposing of the HLLW is to incorporate the wastes in a concrete mixture and to let the mixture solidify in existing tanks. This would be accomplished by first neutralizing the acidic wastes from the small, stainless steel tank and adding them to the large, carbon steel tank after which the total waste volume would be reduced by evaporation. The resulting concentrated wastes would be pumped from the large tank, mixed with cement and aggregate and injected into the spare large tank. The now empty contaminated tanks and their surrounding vaults would be filled with clean concrete. Because of the heat generated in the radioactive wastes, the spare large tank with the solidified wastes would be cooled with water and air through about 1996. After 1996, the surrounding vault would be filled with concrete (entombment). Surveillance of the site would continue through entombment and for an extended period thereafter until the site could be released for unrestricted use.

Costs (Millions of $)		Radiological Impacts (man-rem)[t]		Time to Complete
Capital	Annual	Occupational	Population	
11	.07	140	less than 0.5	5 yrs.

STATUS OF TECHNOLOGY: Although in-tank solidification has never been done in the U.S., NFS considered this option and treated it in "Safety Analysis of In-Tank Solidification of High-Level Wastes at West Valley," May 1971. A considerable amount of work has been done by DOE laboratories on incorporating liquid radioactive wastes in cement mixtures. However, the composition of the WNYNSC wastes has not been considered and would require some study to determine the feasibility of this option. $800,000 is included in the above estimate for evaluating cement mixtures and processing techniques.

OPTION: Immobilization in Glass of High-Level Liquid Wastes

DESCRIPTION: The HLLW from the larger tank can be pumped to an empty tank in the existing reprocessing building. The wastes would then be processed to remove solid materials from the liquid; these solids would be transferred to another tank for subsequent treatment. The clear liquid, about 90 percent of which is sodium nitrate/nitrite, would then be treated to remove virtually all the dissolved radioactive materials and then evaporated. The residue would be about 26,000 cubic feet of damp salt crystals (salt cake)[t] which would have such small residual radioactivity that it could be handled as a chemical waste at a disposal area assumed to be 1000 miles away.

The solids removed from the neutralized waste and the radioactive materials removed from the liquid phase could be mixed with the acidic HLLW from the small waste tank. The resulting slurry would then be pumped to the spray calciner. In the calciner, liquid droplets are quickly decomposed and dried to a fine powder (calcine)[t]. The calcine can be mixed with glass-forming additives and heated to vitrification[t] (glass-forming) temperatures (2000°F) in a stainless steel canister. After vitrification, the canisters would be cooled, sealed, and decontaminated. The sealed canisters would then be removed for storage or shipping. The WNYNSC high-level liquid wastes would yield about 6300. cubic feet of glass, equivalent to 224 canisters, each two feet in diameter and ten feet long. It is assumed that these canisters will be shipped to a Federal repository up to 3000 miles away.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
120	Not Applicable	280	14	9 yrs.

STATUS OF TECHNOLOGY: The incorporation of radioactive wastes into glass is the solidification technique developed in most countries with active nuclear power programs, including England, France, Germany, and the United States. The use of borosilicate[t] glass (similar in composition to Pyrex) is attractive because of the ease and safety of transportation; the resistance of this glass to the combined effects of temperature, irradiation, and water erosion; and its compatability with container materials during long-term storage. The technology for processing waste into glass is advanced in the U.S. Since 1966, over 50 million curies of radioactive materials have been incorporated into glass at Pacific Northwest Laboratories (PNL) in a series of demonstrations.

Although this immobilization process is well developed, some specific process development work must be performed to adjust it to the specific characteristics of the WNYNSC wastes. These activities would cost about $2 million and are included in the costs shown above.

2.2.2 Disposition of High Level Liquid Waste Tanks

The 750,000-gallon carbon steel tanks each sit within a steel pan which serves as a second barrier to leaks. Each tank, with its pan, is enclosed within a two-foot-thick concrete vault. The vaults are surrounded by relatively impermeable soil (silty till)[t] and are eight feet underground. Both 15,000 gallon stainless steel tanks are contained within a single, reinforced-concrete vault which is partially lined with stainless steel. This vault also is surrounded with silty till and is buried six feet underground.

2.2.2.1. OPTION: In-Situ Stabilization of Waste Tanks Using Soil

DESCRIPTION: If the contents of the tanks are removed, a low option for tank disposition would be to fill the tanks and surrounding vaults with soil and seal them. This would require restricted access to this area of the site continuous surveillance. Support equipment that had been needed for continued tank operation would be removed. The entire area would be graded to a minimum depth of 8 feet over the large tanks and 6 feet over the smaller tanks, planted with grass and marked with durable markers. Access to the area could be restricted with a fence and protected by electronic surveillance. The tank area might require frequent inspection.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
3.3	.03	40	Less than 0.5	1 yr.

STATUS OF TECHNOLOGY: Although appropriate caution would be required due to the contamination remaining in the tanks, no research and development would be required.

2.2.2.2. OPTION: Dismantle High-Level Liquid Waste Tanks

DESCRIPTION: Dismantling the four emptied HLLW tanks would involve making penetrations into the tank tops to remove internal structures for decontamination and packaging. Contaminated materials would then be shipped to a Federal repository. The vaults would be decontaminated and the vault cavities backfilled with soil.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
20	Not Applicable	240	6	2 yrs.

STATUS OF TECHNOLOGY: Underground radioactive waste tanks have never before been dismantled. Costs for adapting techniques for remote cutting, handling, and packaging specific for this option are included in the $20 million estimate.

2.2.3 NRC-Licensed Burial Grounds

The NRC-licensed burial area comprises about 7.2 acres, of which approximately one acre has been used. The radioactive wastes buried there consist of metallic cladding hulls from fuel elements reprocessed at the Center; various large items including process vessels and equipment; and miscellaneous items, such as ventilation filters, laboratory wastes, and other process-related debris. Also buried in this area are a number of ruptured fuel assemblies from a government reactor. They are encased in concrete. These wastes were buried in the silty till in holes 50 feet deep (much of the waste was packaged in steel drums). This burial area was originally used to dispose of solid, long-lived radioactive material wastes from the reprocessing plant and was licensed as part of the plant complex for this purpose. Its present use is for burial of the small amount of wastes generated through reprocessing plant maintenance operations. The total wastes buried there from 1966 to date amount to about 139,000 cubic feet containing approximately 550,000 curies. Records of buried wastes are maintained and the individual holes are marked and indexed.

2.2.3.1. OPTION: Extended Care - NRC-Licensed Burial Grounds

DESCRIPTION: A confirmatory assessment of site conditions would be performed to assure erosion stability, radioactivity retention, and water infiltration resistance. A small amount of regrading might be desirable. Vegetative covers would then be established on all disturbed areas and a chain link fence erected around the area to prevent inadvertent intrusion. The care program would include monthly inspection and maintenance and quarterly radiological sampling.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
.15	.04	1	Less than 0.5	About 1 month

STATUS OF TECHNOLOGY: The technique of maintaining solid radioactive material in burial grounds has been in use since the early 1940's at Federal sites and since 1963 at commercial sites. Proper management techniques for erosion control, trench monitoring and trench cap maintenance are available. Hence, it is not expected that any substantial research and development costs would be required to support the implementation of this option.

2.2.3.2. OPTION: Exhume NRC-Licensed Burial Grounds

DESCRIPTION: The exhumation option entails digging up the buried wastes and any surrounding contaminated soil, packaging it for shipment, and transporting the material to a Federal Repository. A temporary air-tight structure would be needed to enclose the entire operation. After completion of the exhumation, the area would be back filled with uncontaminated soil.

Completely remote handling of the waste would be required. Contaminated soil will have to be treated as waste and packaged for shipment as well. In estimating the cost of this option, it was assumed that the contaminated soil would not need to be processed and could be transported in the form it was retrieved.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
340	Not Applicable	760	280	10 yrs.

STATUS OF TECHNOLOGY: The ability to safely retrieve waste from a burial ground is currently under development at DOE's Idaho and Richland, Washington sites. The Idaho work has been limited to techniques applicable to lower activity wastes than are found in this burial ground. The Richland work has required techniques that would be applicable for this burial ground. Since additional development work will be completed in the mid-1980's at the Idaho site, no additional studies are expected to be required.

2.2.4 NYS-Licensed Burial Grounds

The New York State licensed burial grounds were opened as a commercial venture in 1963 to receive low-level wastes for permanent shallow land burial. Although the NRC has jurisdiction over the licensing of burial sites, it has relinquished this responsibility to its Agreement States. New York State is an Agreement State.

The burial grounds comprise 22 acres of the site, approximately seven acres of which were actually used for radioactive material burial. The facility contains two sets of burial trenches: a north area and a south area, each containing seven trenches. The north area was used first (1963-1969) and the south area was used later (1969-1975). Typically, the trenches were 35 feet wide, 20 feet deep, and 600 to 800 feet long, with segments excavated only as needed (depending on the rate of waste accumulation). After the trenches were filled, they were covered with soil to a minimum depth of four feet (only three trenches in the north area had this minimum cover; the remainder have eight to ten feet of covering). Trench boundaries are marked with concrete markers and records of material buried are maintained.

Two holding lagoons for rainwater pumped from open trench areas were also constructed adjacent to the north trenches; a third lagoon was later built near the south trenches. A pipeline connects the lagoons to the low-level liquid waste treatment facility.

About 2.4 million cubic feet of wastes containing 710,000 curies are buried in these facilities. Most of the waste is contained in 55-gallon steel drums or in wooden or cardboard containers. The wastes typically include rags, protective clothing, gloves, wood, filters, failed equipment, and animal carcasses. Only about 23 percent of these wastes originated from operations at the WNYNSC; the remainder came from other institutional, educational, medical, industrial, Federal, and commercial radioactive waste sources and nuclear power plants.

In 1975, water which had leaked into north area trenches with the least depth of cover, flowed out from the top of one trench; in effect, the impermeability of the soil had made the trench fill up like a bathtub and overflow. As a temporary expediency, water was pumped from the affected trenches and treated prior to its discharge to an adjacent creek. At the request of the State of New York, NFS completed, during the summer of 1978, a program to prevent further water infiltration into the trenches by adding an extra layer of soil to the affected trenches. The effectiveness of these measures is being closely monitored.

The two options chosen as bounding the range of possibilities for this burial ground are: (1) extended care, and (2) exhumation and shipment to a Federal repository.

2.2.4.1. OPTION: Extended Care - NYS-Licensed Burial Grounds

DESCRIPTION: A confirmatory assessment of site conditions would be performed to assure erosion stability, radioactivity retention, and water infiltration resistance. An assessment of the adequacy of drainage and the vegetative cover would also be made. An additional chain link fence would be erected to completely enclose the burial area to prevent inadvertent intrusion. The care program would include monthly inspection and maintenance and quarterly radiological sampling.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
.11	.04	Less than 0.5	Less than 0.5	About 1 month

STATUS OF TECHNOLOGY: The technology of near surface burial of low-level wastes is very similar to that found in sanitary land-fill operations. This technology has been in use at government sites since the 1940's. Consequently, no significant development would be required to accomplish this option.

2.2.4.2. OPTION: Exhume NYS-Licensed Burial Grounds

DESCRIPTION: The exhumation option entails digging up the buried wastes and any surrounding contaminated soil, packaging it for shipment, and transporting the material to a Federal Repository for final disposal. The total volume to be packaged and transported would be about 5 million cubic feet. Because of the low activity of these wastes, the exhumation operation could be accomplished using contact methods. Subsequent to exhumation, the area would be backfilled with uncontaminated soil and planted with grass.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
570	Not Applicable	1,000	780	10 yrs.

STATUS OF TECHNOLOGY: DOE's Idaho National Engineering Laboratory (INEL) is currently developing methods for exhuming wastes similar to those in the NYS-licensed burial grounds. Although no large scale burial ground has been exhumed to date, development of techniques to handle these wastes has progressed to the point where no additional development is expected to be required prior to implementation.

2.2.5 Reprocessing Plant Spent Fuel Pool, and Ancillary Facilities

The main process building has about 80,000 square feet of floor space, is 90 feet high, and has a ventilation stack that rises to 200 feet above grade. It is composed of a number of process areas and shielded cells[t] in which remotely operated mechanical and chemical operations were performed. The building also contains the fuel receiving and storage facilities (spent fuel pool), analytical laboratories, and a control room. Smaller structures include an office building, a warehouse, maintenance shops, and a low-level liquid waste treatment facility. The low-level liquid waste treatment facility consists of a building containing waste-treatment process equipment and a peripheral system of lagoons and pits for waste treatment and retention.

The options considered for decontamination and decommissioning of the reprocessing plant and its ancillary facilities are discussed below. Protective storage is not considered to be acceptable for final decommissioning of a reprocessing plant to release the site for unrestricted use. Dismantlement, however, would eventually permit release of the site for unrestricted use. These represent the low and high actions, respectively.5/

2.2.5.1. OPTION: Protective Storage of Plant and Ancillary Facilities

DESCRIPTION: Protective storage would place the facility in a condition that provides protection for the public and the environment, with limited maintenance and surveillance requirements. Implementation of the protective storage option would insure the confinement of radioactivity, and strengthen the security of the facility against intruders. All plant operations except those required for safety and surveillance would be shut down. Any loose contamination in process areas would be collected and packaged to minimize the possibility of its spread. Contaminated process and laboratory equipment would be packaged and placed in the cells. The ventilation system, including the stack, would be removed and also placed in the cells, which would then be sealed. The interior surfaces of the building would be treated to confine any loose contamination. Fuel from the storage pool would be shipped to another site and the pool drained and decontaminated. Similar operations--decontamination and sealing of the facility--would take place at the low-level liquid waste treatment plant. Suitable barriers would be erected to isolate the plant area from the surrounding 3000-acre buffer zone, which could be returned to conditional[t] use. A small surveillance and maintenance staff would be required to provide necessary security and safety.

5/ It should be noted that probably is possible to utilize the existing plant to assist in the disposal of the high-level liquid wastes. Decontamination of the plant should be subsequent to resolution of the fate of the high-level wastes.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
17	.48	320	1	4 yrs.

STATUS OF TECHNOLOGY: Protective storage has been used for decommissioning ten small research reactors. No substantial amount of development effort is expected to be necessary prior to implementation of this option.

2.2.5.2. OPTION: Dismantle Plant and Ancillary Facilities

DESCRIPTION: Dismantlement of the main process facility and the fuel-receiving and storage facility would first involve removing, packaging, and transporting to a repository all hazardous materials and equipment. The facility structures would be decontaminated, if possible, or demolished and shipped as hazardous materials. The low-level liquid waste treatment facility would similarly be completely dismantled, and the contaminated portions of the soil in and around the lagoons would be removed, packaged, and shipped away as well. Structures such as the office building and warehouse may be salvageable and could be left standing for use in some future use application. Backfilling the plant site and planting of vegetation would follow.

Costs (Millions of $)		Radiological Impacts (man-rem)		Time to Complete
Capital	Annual	Occupational	Population	
46	Not Applicable	570	18	6 yrs.

STATUS OF TECHNOLOGY: This dismantlement process itself differs from conventional demolition chiefly in that special attention is required for the confinement of dust and for the protection of workers. To date, only one small reactor has been completely dismantled. However, studies have been done on the feasibility and costs of dismantling radioactive facilities. Of special note is the study recently completed by DOE on the costs of dismantling a large defense reprocessing plant at Richland, Washington, and a study done by the NRC (NUREG-0278) entitled "Technology, Safety and Costs of Decommissioning a Reference Nuclear Fuel Reprocessing Plant."

A particularly difficult task associated with dismantling the WNYNSC plant would be the development of techniques for remotely decontaminating areas of the plant to allow access for standard demolition. Dismantlement was not a consideration during the design of this plant and provisions were not included for remote decontamination of many areas. As a result, it may be impossible to decontaminate some of the cell areas without exposing workers to excessive radiation.

2.3 NUCLEAR OPTIONS FOR CONTINUED USE OF WNYNSC FACILITIES

The WNYNSC facilities have some unique features which represent potentially valuable resources to the local community, New York State, and the Nation. The low-level burial ground and the spent fuel storage pool are conveniently located close to the concentration of reactors in the northeastern U.S. The reprocessing plant is very versatile, with the capability to process almost any type of nuclear fuel. The plant's radiation containment cells are useable in the Nation's nuclear radioactive waste and technology development programs. Some of the options for utilizing these facilities are outlined below. Continued use of the high-level liquid waste tanks and the NRC-licensed burial ground were not considered to represent likely options for continued use of the site.

2.3.1 NYS - Licensed Burial Ground

Three commercial shallow land burial areas are currently operating in the United States; only one of these (Barnwell, SC) is east of the Mississippi River. Universities, hospitals, research laboratories, and industrial sources produce about one million cubic feet of solid radioactive wastes annually; nuclear power production generates an additional 2.25 million cubic feet per year. Most of this waste is produced in the northeastern United States. Reopening the state-licensed burial area would reduce transportation requirements for this waste, thereby significantly reducing wastes disposal costs and risks to the general public, which primarily result from transporting wastes.

If current waste burial techniques were used, the remaining capacity of the currently licensed burial grounds would be about 2.7 million cubic feet. This capacity could be increased to 11.7 million cubic feet if similar nearby land on the site were utilized. Use of the more land-efficient burial techniques now being considered would greatly increase the above capacities. Capacity could also be increased by using other areas of the site which prove to be acceptable. Extending the length of time that the site would be available for use could be accomplished through administrative actions such as that taken by the State of South Carolina to limit the amount of material that can be disposed of in any year.

The considerable quantity of information available about the adequacy of the site for radioactive waste storage and the experience gained to date in operating the burial grounds make its continued use attractive.

Operation would entail occupational radiation doses[t] of about 50 man-rem per million cubic feet of waste buried. Transportation of the wastes to the site would result in a dose to the general population of about 18 man-rem per million cubic feet. Were the burial ground reopened, the dose to the total population from the transportation of low-level wastes generated in the northeastern U.S. would be much less than that associated with continued shipment of the wastes to other regions of the U.S.

The operation of burial grounds has been a viable commercial venture since 1962.

2.3.2 Reprocessing Plant

The plant contains large radiation containment cells which are expensive to construct and of which there are only a very limited number in the U.S. Possibilities for using this facility include: nuclear waste immobilization R&D and alternate fuel cycle R&D.

In April 1977, the President announced that due to the risks of nuclear weapons proliferation associated with conventional reprocessing, the U.S. would defer indefinitely the reprocessing and recycling of plutonium[t] produced in U.S. nuclear power programs. During this deferral, the U.S. is evaluating alternative fuel cycles and processes to determine if nuclear weapons proliferation risks can be reduced while still providing for the continued use and growth of nuclear power. Consistent with this policy, the WNYNSC facilities could be used to conduct research on the viability of proliferation resistant fuel processing alternatives. The capabilities of the existing plant are such that processes which (1) do not separate the plutonium formed in the reactor from the unburned uranium (reducing possible proliferation of weapons material) or (2) which place highly radioactive materials in the final fuel material produced (which makes theft of fuel very hazardous), can be readily studied. Fuel systems based on thorium could also be studied at the WNYNSC. The Center could be used for research and development dealing with fuels for any reactor system.

Radioactive waste R&D is generally conducted within the confines of radiation containment cells similar to those in the plant. The option for solidifying the existing wastes in these cells was presented in Section 2.2.1. A more extensive waste solidification demonstration could be accomplished in a new facility for waste solidification. The existing facility could generate other wastes (representative of different fuel cycles) for solidification.

Because nuclear processing facilities are inherently expensive, the dollar savings from successful modification and reuse of the plant might be many millions of dollars. Such reuse would also provide employment for perhaps 100 or 200 persons. Finally, this already contaminated facility may be used in lieu of contaminating a new facility.

2.3.3. Spent Fuel Storage Pool

The fuel storage pool is being maintained operational. The facility contains about 165 MT of spent fuel assemblies and is now about two-thirds full (spent fuel is nuclear fuel that has been removed following irradiation in a reactor). While up to an additional 150 MT of spent fuel can be stored in the pool using the present storage rack arrangement, the storage capacity could be expanded to accommodate about 1000 MT of spent fuel if the racks were replaced with new ones that allow more compact storage. The cooling and waste-handling capabilities of the existing equipment are more than adequate to handle this additional load. Such an approach would make available a significant storage capacity at considerably lower costs than construction of a new storage pool; in addition, it would allow more efficient use of the existing spent fuel pool capabilities. The current deferral of reprocessing reactor fuel means that spent fuel assemblies removed from operating reactors must be stored either at the reactor site or in a storage facility away from the reactor (AFR).[t] Studies indicate that several thousand metric tons of additional spent fuel storage capability will be needed by the mid-1980's.

Continued use of the spent-fuel storage facility would contribute to meeting the U.S. need for such facilities at a small incremental cost, while maintaining the present employment level of 12 persons.

2.4 NONNUCLEAR OPTIONS FOR USE OF THE SITE

Only about 225 acres of the 3345-acre WNYNSC site have been used for the reprocessing plant complex; the return of that portion of the site to any sort of general, unrestricted use within the next few decades would necessitate a comprehensive program of decontamination and decommissioning. Return of much of the 3100-odd acres remaining to unrestricted use might be possible relatively quickly. However, since this land serves as a buffer zone or "exclusion area" for the plant complex, its unrestricted use would have to be deferred until decontamination and decommissioning activities have been carried out. Recreational or industrial development could become practicable afterwards. Forestry or some types of farming on a lease basis might be feasible in the near term provided that adequate control of the overall site is retained by the organization responsible for any projected decontamination and decommissioning activity.

2.4.1 Farming

Prior to its acquisition by the State in 1960, the site was used for farming and wood lots. A few hundred acres of the site are suitable for row crops. About the same acreage might be suitable for pasture. Return of the land to dairy farming would be conditional on a careful investigation of the extent of soil contamination and subsequent resolution of the possible regulatory policy issues.

2.4.2 Forestry

The eastern-northeastern portion of the site along Buttermilk Creek and the southern-western part are covered by deciduous forest. The types of timber commonly found include: sugar maple, hemlock, red maple, beech, white ash, basswood, and black cherry. There are also pine and spruce plantations at the northern end of the site. With proper management, the forestry potential of the site could be substantial. Forestry development would probably be compatible with any decommissioning option which might be undertaken in the developed portion of the site. Such development need not require a transfer of ownership from the State, although appropriate long-term agreements with private individuals or firms might be required so that multiple use of the land, e.g., for recreational purposes, could be achieved at a later date. The forest contains approximately three million board feet of timber, the value of which is conservatively estimated at $300,000.

2.4.3 Recreation

There are few recreational facilities near the Center. The combination of the wide range of wildlife habitats, hilly topography, bodies of water, and fair road access make the WNYNSC site potentially attractive for recreational development. New York recreational planners believe there will be an increasing need for such facilities as the Buffalo-Rochester metropolitan area expands. Camping, skiing, golfing and water sports are popular recreational activities in the area. U.S. 219, which passes by the site, is expected to be improved to "super highway" status within the next decade. In the longer term, recreational development, perhaps combined with forestry, may be an appropriate use of the land. As noted above, questions of possible contamination and of other activities at the plant complex would need to be resolved before any schedule for such development could be established. While recreation may be a relatively low income and low employment option, it would constitute a reasonable use of the land.

2.4.4 Industry

New York acquired the site and established the Center with the expectation of nuclear industrial development. The nonhilly fraction of the site (somewhat less than one-half) appears to have the prerequisites for a wide range of potential nonnuclear industrial development--road and railroad access and availability of utilities. Attractive lease arrangements could assure substantial industrial development with resulting increased state and local revenues and employment opportunities.

2.4.5 Nonnuclear Energy Research

At the first DOE public meeting held relative to this study (West Valley, NY, March 18, 1978), several suggestions were offered that the site characteristics appear to be adequate for nonnuclear energy research. Unique advantages were not identified.

Although the site is well located to provide environmental conditions similar to those found elsewhere in the east, the average annual wind energy[t] at the site is $1.5 MWh/m^2$, compared to a value of $2.0 MWh/m^2$ considered to be necessary for economical power production. Similarly, R&D for solar energy[t] applications generally requires a mean annual solar energy level of about 6 $kw\text{-}hr/m^2$. The mean annual solar energy level at the site is less than 4 $kw\text{-}hr/m^2$.

The site is serviced by a rail spur and as such is capable of importing nonnuclear fuels (e.g., biomass and coal) to support related R&D activity.

2.4.6 National Environmental Research Park

The Federal Government is encouraging the designation of a network of environmental research parks throughout the U.S. for the purpose of conducting research on the impact of technology on the environment.

Large sites are needed in the northeastern section of the country which typify the range of wildlife, topography, and waterways of that area. Preliminary indications are that the West Valley site may satisfy these criteria. Further study would be required to determine the suitability of the site for use as a research park.

The park could conceivably be conducted in conjunction with limited industrial activity or nuclear or nonnuclear research on the site, and would be extremely valuable for monitoring the effect of decontamination

and decommissioning activities on the ecosystem. Although the bulk of the site would need to be closed to the public to ensure accurate study data, the park could be compatible with the growing outdoor recreational attraction of the area by providing programs for public interest and education, such as lectures, tours, and a visitors' center. In addition, other research and training programs could be administered onsite by nearby universities and colleges, as well as by Federal, State, and private concerns.

Employment possibilities would vary with the type of research programs and the extent of the facilities. The park would not be as labor intensive as, for example, an industrial park; however, in addition to the scientific staff required, there would be a need for some support staff to operate the facility. The initial construction and installation phase would offer short-term employment opportunities.

2.5 SOCIOECONOMIC IMPACTS OF SITE OPTIONS

This section summarizes socioeconomic impacts for all the options considered.

2.5.1 General Considerations

Historical Background

The State of New York established the WNYNSC in 1959-1961 with the intent to encourage the development of substantial new nuclear-related industrial activity in western New York in order that its citizens might benefit from the resultant increased tax base and employment. Although the actuality fell well short of the State's early expectations, the construction and operation of the facilities did provide a relatively small, but welcome, increase in employment in Cattaraugus and Erie Counties, and a substantial increase in the local tax base. NFS had about 200 regular employees as compared to total nonagricultural employment in Cattaraugus County of about 26,000. Taxes on the plant have constituted 15% to 20% of the Town of Ashford and West Valley Central School District tax revenues.

Since employees' residences were distributed over 20 municipalities, no crowding or overtaxing of public services occurred. Only Springville (population about 8000) was the place of residence of more than 20 NFS employees in 1971.

Character of Socioeconomic Effects of Economic Activity

Economic activity in any specific locality is generally considered to benefit the residents of the surrounding area by providing employment, income, and additional tax revenue to support public services. However,

in many "boom town" cases, rapid expansion of employment with a resultant population surge due to the in-migration of workers from distant areas has been observed to produce such adverse consequences as the overloading of public services, housing shortages and the resulting eruption of unplanned temporary housing, and even the destruction of the prior sociological structure.

Generally, it appears that a steady or gradually increasing level of economic activity benefits an area, as judged by its residents, but that rapid fluctuations in activity and employment impose many unpleasant side effects.

Industrial employment, such as that at the NFS plant during its period of operation, normally induces additional employment in such service industries as restaurants, garages, and retail stores. The level of induced employment roughly matches that of the primary employment, so that one new industrial job results in a total of two employment opportunities. Since the area within 10 or 15 miles of the WNYNSC is predominantly rural with an average per capita income of about $3,550 (compared to the national average of about $5,910) and has a high unemployment level (about 9.7% in 1976, compared to the national average of 7.0%), any moderate increase in stable employment opportunities would undoubtedly be of benefit to the area.

2.5.2 Decontamination, Decommissioning and Waste Disposal Options

Of the decontamination, decommissioning, and waste disposal options, those associated with the waste burial areas display the widest variation with respect to probable socioeconomic effects. The continuous maintenance and surveillance approach, apart from some initial construction-type work to improve drainage and stabilize surfaces, would create long-term employment for a very few persons. In contrast, the exhumation approach would require a large-scale, specialized (because of the radioactivity) earth-moving project accompanied by shipping of a great amount of the exhumed earth to some distant disposal area. A very large, but short-term, project requiring specialized skilled labor would probably not offer many employment opportunities to present residents of the West Valley area. By its very nature, it could not provide stable long-term employment. Dismantlement and removal of the process plant and ancillaries would also be a large, specialized construction-type project offering only a limited amount of short-term employment to present residents.

Retrieval and solidification of the high-level liquid wastes, on the other hand, would probably extend over a decade or more for research and development; design and preparation of facilities; and the actual solidification, packaging, and shipment of the wastes. For such a long-term program, perhaps combined with decontamination and protective storage of

the process plant, it would be feasible to employ and train local residents as most of the work force. The resulting stable employment would probably compare with that of the NFS plant during its operating period.

The probable adverse socioeconomic effects associated with the decontamination, decommissioning, and waste disposal options are largely confined to the several dismantlement and exhumation options, since these would require large temporary work forces and shipment of a large volume of the removed soil or material.

In any case, proper planning and scheduling could avoid the imposition of any serious nuisance effects upon the residents of the area.

2.5.3 Continued Nuclear-Related Use of the Site

With respect to socioeconomic effects, any of the continued uses discussed in Section 2.2 would provide some stable employment without significant adverse socioeconomic effects. Only reuse of the process plant, presumably for Federal research and development, would result in very many jobs. Activation of the process plant would probably result in employment comparable to that in the earlier years of operation (ca. 200 jobs), while either the spent fuel storage facility or the low-level waste burial ground would require a work force of only 10 or 20 people.

2.5.4 Nonnuclear Alternatives for Use of the Site

Of the possible nonnuclear uses considered in Section 2.4, only industrial development or the use of the site for some governmental purpose, such as energy research and development, would have the potential for any great amount of employment. Return of the arable portions of the site to farming would create average employment of only a few persons. The average employment associated with forestry would be even less. The character of recreational use would influence the associated employment, but it is likely that only a few jobs would be created.

Establishment of an environmental research park would provide some limited employment opportunities which may actually increase modestly with time as ecological studies expand to determine the effect of any new activity on the present developed portion of the site.

3. INSTITUTIONAL ASPECTS

The Authorization Act instructed that the study shall recommend an allocation of existing and future responsibilities among the Federal Government, the State of New York, and present industrial participants in the Western New York Nuclear Service Center. With respect to the Center, the matter of responsibility can be divided into three major parts: (1) responsibility for decisions on what the future actions should be (Section 3.1), (2) responsibility for the execution of future actions (Section 3.2), and (3) responsibility for the costs of these actions (Section 3.3).

DOE perceived the provision of the Authorization Act governing this study as a strong indication of Congressional intent that remedies other than those available to the parties under present law may be more appropriate in the case of West Valley. In the spirit of this intent, the allocations of responsibility contained herein are intended only as guides for arriving at a solution. As such, they are not intended, and do not prejudge, allocation of responsibility which would arise from the existing contractual and licensing situation surrounding the West Valley operation. Such allocations involve legal issues which can only be disposed of through procedures which allow full representation of all involved parties.

3.1 RESPONSIBILITY FOR DECISIONMAKING

Future disposition of the facilities and wastes at the Center, if different than the disposition originally intended, should reflect national perceptions and developing policy. DOE plays a major role in the Federal Government's responsibility for developing national radioactive waste management policy. DOE has acquired technical and management capabilities in nuclear waste management. These should be made available for the disposition of the facilities and wastes at the Center.

Since the State of New York is the owner of the Center, ultimate responsibility for decisions on the Center's disposition should remain with the State. DOE should prepare recommendations which reflect all pertinent national policy considerations, and submit them to the State for its consideration in rendering such decisions. The State should solicit and address comments from the public. Involvement of the Federal Government in the decisionmaking process may require additional analysis pursuant to the National Environmental Policy Act (NEPA) prior to making decisions concerning the final disposition of the Center. Similarly, such decisions may need approval of regulatory agencies.

NRC/EPA should provide the regulatory input needed to support any D&D activity. A specific regulatory action that will be required concerns the existing NFS operating license. The Lease and Waste Storage Agreement between NFS and the State of New York will expire on December 31, 1980. NFS has previously expressed a desire to withdraw from the fuel processing business and accordingly has not sought to renew the lease. NRC envisions

that two options are available for NFS to complete the responsibilities associated with its operating license. The options are (1) license transfer or (2) license termination. The procedures for these actions are described, respectively, in Title 10, Parts 50.80 and 50.82 of the Code of Federal Regulations.

A schedule of possible events is shown on Figure 3-1. This figure, in essence, presents the most optimistic schedule that may be possible for resolution of West Valley issues. (It should be noted that the transition date of October 1980 shown in this schedule occurs two months prior to the expiration of the Lease and Waste Storage Agreement between NFS and New York State.)

3.2 RESPONSIBILITY FOR EXECUTION OF ACTIONS

Once a decision is made with respect to the future of the Center, responsibility for execution of actions can be assigned.

3.2.1 Possible Initial Decontamination and Decommissioning (D&D)

Initial D&D of the facility could begin for areas of the Center that: require D&D work prior to continued use, whether such usage is nuclear or nonnuclear; or for parts of the Center for which no future use has been identified. For performing the D&D activities, the following are possible options:

(1) New York State owns the Center and manages the D&D activities

State and local residents would derive substantial benefits from State ownership;

(a) during the period that the Center is utilized for nuclear purposes, by allowing compatible uses of portions of the site for local programs or for tax-generating private activities, and

(b) after the Center is no longer used for nuclear purposes, by having the option to use or dispose of the site in a manner which will best serve State and local interest.

Management of D&D activities would most likely require technical and management expertise in nuclear matters beyond that currently available to the State.

(2) The Federal Government owns the Center and manages the D&D activities

The principal advantage to Federal ownership of the site is that it places ultimate responsibility for long-term care with the Federal Government.

KEY DECISION SCHEDULE

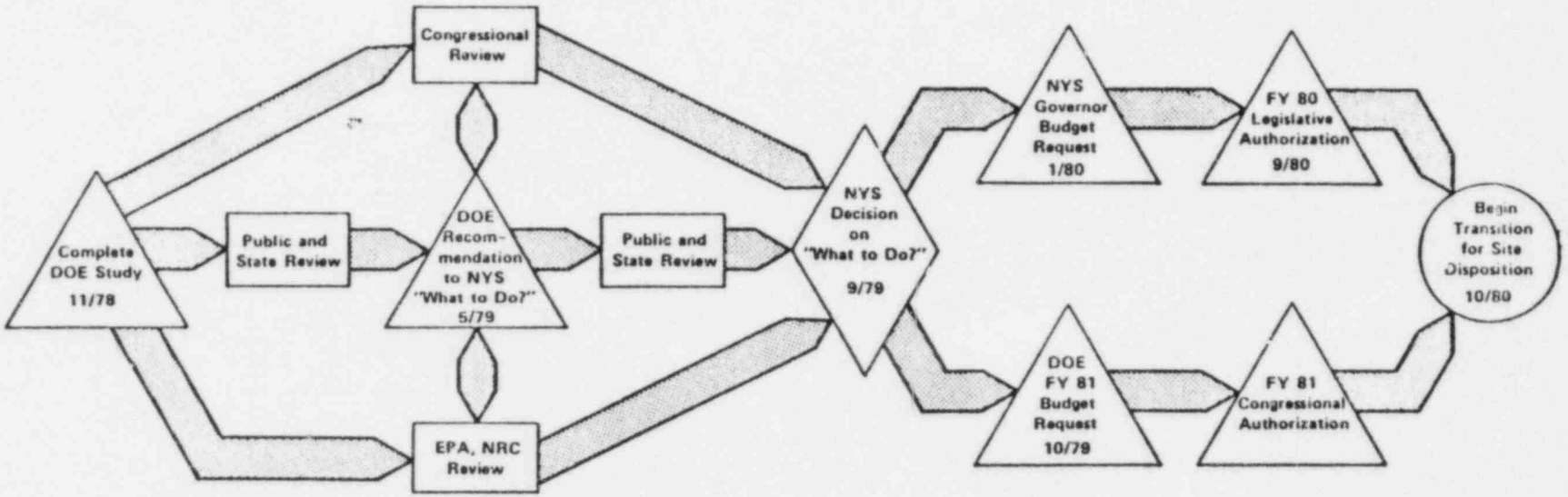

Figure 3-1

With regard to D&D activities, DOE is the only agency (State or Federal) with readily available technical and management expertise in nuclear technology. (Both the NRC and EPA have substantial nuclear expertise. Their function, however, is primarily regulatory in nature.) In addition, there is a similarity between the situation at the Center and at some DOE installations.

(3) New York State owns the Center and the Federal Government manages the D&D activities

This option would combine the advantage of State ownership of the site with the advantage of Federal management of D&D activities. However, it would leave the responsibility of long-term care of the site with the State.

There are substantial benefits to be derived from either State or Federal ownership. With regard to benefits, therefore, the DOE is neutral between the Federal ownership option and the State ownership option.

3.2.2 Possible Continued Uses of the Center

Management responsibility for continued site utilization would be subject to whatever arrangements are contracted between any future user of the Center and the owner (the State). For example, if the Center were to be used for the advancement of Federal programs, the State and the Federal Government would need to negotiate regarding responsibilities for assuring the safe operation of the plant. If the facility were to be used by private industry, similar negotiations would be necessary.

3.2.3 Ultimate Decontamination and Decommissioning (D&D)

Areas of the site which were not initially decontaminated and decommissioned or which become contaminated by some future nuclear use will eventually require appropriate D&D. The responsibility for management of and paying for the cleanup associated with any future use of the site should be with the organization involved in the continued use of the site. For example, if the Federal Government uses the facility for purposes of demonstrating a form of nuclear waste immobilization, then the Federal Government is responsible for the D&D required to clean up those portions of the facility used for this purpose. Excluding the cleanup associated with future use of the site, the same options for site ownership and D&D management presented in Section 3.2.1 are applicable.

Figure 3-2 summarizes DOE's recommendations on D&D management responsibilities.

MANAGEMENT RESPONSIBILITIES

Action	Party
Initial D&D management	DOE
Future use management	User
Ultimate D&D management	
-- From previous site operation	DOE
-- From continued use of the site	User

Figure 3-2

3.3 FINANCIAL RESPONSIBILITIES

This section will present:

(1) The method used in evaluating financial responsibilities,

(2) The considerations included in the evaluation of financial responsibilities,

(3) DOE recommendations on determining financial responsibilities.

3.3.1 Method

To assure that the basic method could serve as a starting point for future discussions, regardless of whether or not the recommendations contained in this report are adopted, it was felt necessary to keep the general approach relatively simple.

The issue of allocation of financial responsibilities was separated into two questions:

1. Who should pay?

   Involved Parties: Federal Government
   New York State
   Nuclear Fuel Services, Inc.
   Industrial Users

   Basis of Involvement: DOE assessment of existing agreements and contractual commitments and their implications as well as the positions of the State, the public, industry, and Federal entities.

2. How much should each Party pay?

   A reference and one alternative case for allocating financial responsibility are presented. They are described below. The alternative case is titled "Federal Cost Recovery."

   Considerations: Contractual commitments
   Past benefits and actions
   Future benefits
   Applicable precedents

   Each of the above four considerations were evaluated independently for each technical D&D option considered (Section 2), and for each of the four parties involved at the Center. In the reference

case, all four considerations were given equal weight. Roughly quantitative "responsibility factors" were defined for each of the above considerations as follows:

Responsibility Factor	Corresponding Percentage Responsibility Rating
Zero	0%
Very Low	1% - 20%
Low	21% - 40%
Medium	41% - 60%
High	61% - 80%
Very High	81% - 100%

Responsibility factors were assigned to each of the involved parties for each of the four considerations and were averaged to determine the overall responsibility factor. These factors were determined for each of the technical D&D options explored earlier (Section 2).

3.3.2 Considerations

(1) Contractual Commitments

From a contractual point of view, it is assumed that the ultimate responsibility for the Center rests with the State of New York. (See GAO report to the Conservation, Energy and Natural Resources Subcommittee of March 8, 1977.)

(2) Past Benefits and Actions

Four groups either benefited or expected to benefit from the construction and operation of the NFS plant. These groups were:

- The Federal Government - through the U.S. Atomic Energy Commission, encouraged development of a commercial fuel reprocessing industry;
- The State of New York - acquired the land, encouraged industry to locate there, and willingly accepted risks in the hopes of developing an augmented industrial base in western New York;
- Nuclear Fuel Services, Inc. - achieved an early entry into an industry which they expected to be highly profitable and in which they hoped to obtain the dominant position; and
- The users - utilities which received the benefit of additional space in their spent fuel storage pools and credit for or return of materials recovered in processing.

Except for the first year of operation, Nuclear Fuel Services, Inc. did not profit from the Center's operation. NFS is responsible to the State for payments to the perpetual care fund until the Lease and Waste Storage Agreement expires at the end of 1980. Originally, this fund was expected to provide for perpetual care of the liquid high-level wastes now stored in tanks and for the wastes in the burial grounds. This fund is expected to total between $4.7 and $5.1 million[6/] which is at least a factor of five below what would now be needed (according to new estimates) for perpetual liquid storage. NFS is also responsible for maintaining the process plant and support facilities in good condition.

The State, which established the Center on its own initiative, owns the site and, through the lease and the NRC license (CSF-1) accepted perpetual responsibility for the radioactive wastes produced at the NFS plant.

Since the NYS-licensed burial grounds are conveniently located, users realized reduced waste transportation costs.

In principle, all four groups should share some financial responsibility for an acceptable disposition of the site. In practice, however, any financial liability which might be imposed on these utilities would be passed on to their customers. Since today's customers of any utility may not be those who benefited previously and since the utilities had entered into a fixed-price agreement for processing, an assessment of the utilities may not be appropriate.

(3) Future Benefits

The party which stands to benefit from the future D&D actions taken at the site should be willing to bear some financial obligation due to such benefit. Future benefits may be in the form of financial compensation from operation of the site; increased tax revenues and employment; improved technology resulting from D&D of the site; and political, social and environmental benefits gained through the removal of possible hazards and the resolution of a complex and controversial issue.

(4) Applicable Precedents

There are many instances in which the Federal Government has provided funds to states and municipalities to deal with what are primarily local problems. Recently, the Federal Government recognized and assumed a "compassionate responsibility"[7/] to provide financial assistance to the State of Colorado for the purpose of undertaking actions to limit the exposure of individuals resulting from uranium mill tailings which were used as a construction material in the Grand Junction, Colorado, area. In that case, it was agreed that the Federal Government pay 75% and the State 25% of all remaining work to dispose

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6/ Payments made by NFS, Inc., are held and invested by New York State. Uncertainty in the yield of these investments accounts for the uncertainty in what will actually be available in the fund on December 31, 1980, (the lease expiration date).

7/ Public Law 92-314, Title II, Sec. 201, dated June 16, 1972.

of the mill tailings. Any D&D actions taken at the WNYNSC would be intended to reduce the potential for exposure to individuals from material located at the Center. As such, the Federal position on the Grand Junction matter could similarly be extended to the situation at the Center. Accordingly, for each D&D option examined, from the viewpoint of "applicable precedents," the Federal Government was assigned a "high" responsibility factor and the State a "low" responsibility factor. (Other precedents, if determined to be appropriate, could be substituted in the analysis which could either increase or decrease these factors.)

3.3.3 "Federal Cost Recovery"

Allocation of responsibility could be left to strict application of the terms of contracts, provisions of licensing regulations, and principl of law. Under such application, it is possible that the State's burden would be very high, and NFS's burden would be low.

In this alternative, it is assumed that it will be necessary for the Federal Government to initially be responsible for the costs associated with providing the resources (managerial, technical, and financial) needed to implement the D&D option(s) selected for the WNYNSC. However, such costs are ultimately to be recovered by the Federal Government. The cost recovery approach currently is the basis for charges for the uranium enrichment services being provided by the Federal Government to the commercial nuclear power industry. A similar approach is also being considered for the U.S. Spent Fuel Program.[8/]

If such an approach were applied to the WNYNSC, the State of New York would be responsible for essentially all D&D activities needed at the Center. Therefore, in this case, the State of New York would reimburse the Federal Government for costs incurred in carrying out the D&D. The technical D&D options discussed in Section 2 of this report would then identify potential upper and lower costs that would eventually be required of the State.

A key aspect of the Federal cost recovery approach discussed in the spent fuel report referenced above is that costs are to be recovered over a period of about 20 years using a discount rate of 6.5% and allowing for some adjustments to account for inflation.

8/ DOE/ET-0055 "Preliminary Estimates of the Charge for Spent Fuel Storage and Disposal Services" dated July 1978.

3.3.4 Recommendations for Determining Responsibility

Assuming equal weights are given to the considerations of contractual commitments, past benefits and actions, future benefits, and applicable precedents, and assuming that the State continues as the owner of the site, the responsibility factors in the reference case (Figure 3-3) are recommended.

Different weighting factors would lead to different conclusions. For example, if higher weight were given to contractual commitments the responsibilities of the State would be higher and those of the Federal Government would be lower. The assignment of weights to each of the considerations is to a large degree subjective.

3.3.5 Other Results

Solidification of high-level liquid radioactive wastes into glass is a readily available technology. Previous and present waste management programs have demonstrated and will continue to demonstrate this existing technology. Should a waste solidification demonstration be desired at West Valley, DOE could demonstrate the solidification of the liquid into an alternate waste form. DOE is developing alternate waste solidification technologies and could select one for demonstration consistent with the schedule shown in Figure 3-1.

The FY 1978 Authorization Act directed DOE to prepare the study in cooperation with the Nuclear Regulatory Commission and other Federal agencies, the State of New York, the industrial participants, and the public, and the Secretary of Energy to conduct informational public hearings (in lieu of any formal administrative hearings) prior to completion of the study.

These interactions were made and as a result:

(a) It was found that an overriding concern of virtually all the participating organizations and citizens was the potential health and environmental hazards associated with the waste currently stored at West Valley. There was significant interest in having the Government undertake an epidemiological (radiation effects on human health) study of the West Valley area. Accordingly, DOE is planning to conduct a study of the trends in diseases and the causes of death in the West Valley area.

(b) It was found that the potential loss of tax revenues and employment if the WNYNSC is closed or taken over by the Federal Government is a strong local concern.

Figure 3-3. Summary of Financial Responsibility Factors for Reference Case[a)]

Area/Option	Users	New York State	Nuclear Fuel Services	Federal Government
High-Level Waste Tanks and Wastes				
o High-level wastes	Very low	Low	Very low	High
o High-level waste tanks	Very low	Low	Very low	Medium
NRC-Licensed Burial Ground				
o Extended care	Very low	Medium	Very low	Medium
o Exhumation	Very low	Medium	Very low	Medium
NYS-Licensed Burial Ground				
o Extended care	Very low	Medium	Very low	Low
o Exhumation	Very low	Medium	Very low	Medium
Reprocessing Plant				
o Protective storage	Very low	Medium	Very low	Medium
o Dismantlement	Very low	Medium	Very low	Medium
Spent Fuel Storage Pool				
o Protective storage	Very low	Medium	Very low	Medium
o Dismantlement	Very low	Medium	Very low	Medium

[a]Equal weight was given to Contractual Commitments, Past Benefits and Actions, Future Benefits, and Applicable Precedents.

(c) The scope of this study was expanded to consider future nonnuclear use options of the site and plant dismantlement.

One of the major products from public involvement in this study is the West Valley Tank Decontamination and Decommissioning Task Group Report. This report will continually be reviewed in detail by the DOE and each of the proposed criteria and recommendations will be considered before any recommendation of what should be done at the site is made.

AUTHORIZING LEGISLATION

Public Law 95-238 [S. 1340]; February 25, 1978

DEPARTMENT OF ENERGY ACT OF 1978 - CIVILIAN APPLICATIONS

TITLE I - ENERGY RESEARCH, DEVELOPMENT, AND DEMONSTRATION, AND RELATED ACTIVITIES

Sec 105 (a) The Secretary of Energy shall prepare and submit to the Congress within one year after the date of the enactment of this Act a study which considers the available options, including, but not limited to -

(1) Federal technical and financial aid in support of decommissioning high-level waste disposal operations at the Western New York Nuclear Service Center;

(2) Federal operation of the Western New York Nuclear Service Center for the purposes of decommissioning existing facilities and disposing of existing high-level wastes including a demonstration program for the solidification of high-level wastes for permanent burial;

(3) Permanent Federal ownership of and responsibility for all or part of the Western New York Nuclear Service Center, and Federal receipt of the license from the present co-licensees; and

(4) Use of the Western New York Nuclear Service Center for other purposes.

(b) Preparation of such study shall be in cooperation with the Nuclear Regulatory Commission and other Federal agencies, the State of New York, the industrial participants, and the public, and the Secretary of Energy shall conduct informational public hearings (in lieu of any formal administrative hearings) prior to completion of the study. The study shall recommend allocation of existing and future responsibilities among the Federal Government, the State of New York, and present industrial participants in the Western New York Nuclear Service Center.

(c) Ninety days prior to submission of the study to the Congress, the Secretary of Energy shall release the proposed study for comment by

interested parties, and such comments as are received shall be submitted as attachments to the final study submitted to the Congress.

(d) Nothing in this section shall be construed as intending to commit the Federal Government to any new assistance or participation in the Western New York Nuclear Service Center, nor as relieving any party of any duties or responsibilities under any law, regulation, or contract to provide for the safe storage of nuclear waste.

(e) For the purpose of carrying out the provisions of this section, there is included in subsection 101(20) of this Act authorization of appropriations in the amount of $1,000,000.

GLOSSARY

AFR - Refers to Away From Reactor storage facilities for nuclear fuel assemblies.

BASELOAD - A predetermined minimum level of work for a facility. The processing plant at the WNYNSC was originally designed to process 300 metric tons of fuel per year. The AEC essentially agreed to provide about 625 metric tons of fuel for processing to NFS over five years.

BIOSPHERE - Living beings together with their environment.

BOROSILICATES - Usually refers to glassy materials containing boron oxide which have desirable properties as storage media for reactor wastes.

CALCINATION - Conversion to a powdered product, a metal oxide, by roasting.

CESIUM - Chemical element number 55 produced as a radionuclide in the fission process.

CONDITIONAL USE - Conditional use would permit non-nuclear activities in areas with higher residual contamination levels than unrestricted use, provided that barriers and controls will limit potential doses to the public to no greater than those established for the unrestricted use category.

CURIE - A unit of radioactivity equal to 3.7×10^{10} disintegrations per second.

DECAY - Radioactive disintegration of a radionuclide.

DECONTAMINATION - Execution of a program to reduce radioactivity levels in a nuclear facility to reduce potential health and safety impact on the public.

DECOMMISSIONING - To remove a facility from service.

DOSE - The radiation delivered to a specific part of the body or to the body in general.

ERG - A small unit of energy. Approximately 6 billion ergs would be required to raise the temperature of the water in an eight-ounce glass one degree Fahrenheit.

FISSION PRODUCTS - Elements or compounds resulting from nuclear fission.

HLLW - High-level liquid waste.

HULLS - Pieces of the metal tubes (cladding) which contain the reactor fuel.

KILOWATT - Unit of power equal to that used by ten 100-watt light bulbs (1000 watts).

KILOWATT-HOUR - A standard unit of energy equal to that used by ten 100-watt light bulbs in an hour.

MAN-REM - The product of the number of people exposed to radiation and the dose they receive; thus, one man-rem corresponds to one person receiving one rem, a thousand people receiving one millirem, etc.

METER - Unit of length slightly greater than one yard. A square meter is a unit of area slightly greater than one square yard.

METRIC TON (MT) - 1000 kilograms of material; approximately equivalent to 2200 lbs.

NEUTRALIZATION - To make an acidic solution neutral by the addition of a basic substance such as sodium hydroxide.

NUCLEAR FISSION - The splitting of a nucleus of an atom into at least two other nuclei with the release of a large amount of energy.

OCCUPATIONAL RADIATION DOSE - The exposure of an individual to radiation above background as imposed by his employment.

OXALIC ACID - A strong acid found in various growing plants that is effective as a cleaning agent.

PLUTONIUM - Radioactive chemical element number 94, produced in reactors by neutron capture in uranium; used as a nuclear fuel and in weapons.

POPULATION DOSE - Whole body radiation dose to the general public, expressed as man-rem.

PRODUCTION REACTOR - A Federally owned reactor facility located either on the Hanford Reservation in the State of Washington or the Savannah River Plant in South Carolina used in special nuclear materials production for defense and other Government programs.

RAD - A unit of absorbed dose equal to 100 ergs per gram of material.

RADIOACTIVITY - The spontaneous emission of particles or electromagnetic radiation from the nucleus of an atom.

RADIONUCLIDE - A radioactive form of an element.

REM - Measure of the biological damage caused by an amount of radiation that deposits 100 ergs in a gram of biological material. A man-rem is intended to be proportional to the total risk of radiation damage to a selected population. One person exposed to one rem in the course of a year accumulates a population dose of one man-rem in that year, as would 100 persons exposed to 0.01 rem, one million persons exposed to 0.000001 rem, etc. The two most common populations under consideration are workers at the plant, usually spoken of as occupational man-rem, or residents of the general public outside the plant, usually spoken of as population man-rem. Background radiation from cosmic rays, surrounding soils, etc., plus medical and dental radiation result in the typical individual receiving 0.2 to 0.3 man-rem every year.

REPROCESSING - Separation of fission products and other wastes from usable nuclear fuel by chemical treatment of irradiated fuel elements.

SALT CAKE - A mass of crystallized salt containing enough moisture to cause it to adhere together (to cake).

SHALE - A rock formed by consolidation of clay, mud, or silt; usually in a layered structure.

SHALE FRACTURE - Breaking of underground rock structures (shale) by use of pressurized water.

SHIELDED CELL - A facility in which processing of highly radioactive materials is carried out by remote control.

SILTY TILL - A clay-like soil of glacial origin.

SLUDGE - Matter which falls out of a solution, with a consistency similar to heavy mud.

SOLAR ENERGY - The ability to do work (e.g., create electricity) using the radiation received by the earth from the sun.

SPENT FUEL - Solid bundles usually containing a couple of hundred tubes (about 0.5" in diameter each) in which the uranium and fission products reside. These bundles are removed from the reactor because they have reached their useful (economic) limit. They may be 8" to 10" square and 12′ to 14′ long.

STRONTIUM - Chemical element number 38 produced as a radionuclide in the fission process.

THORIUM - Chemical element number 90, a naturally found radioactive material that can be used to fuel reactors.

URANIUM - Chemical element number 92, a radioactive material found in nature which can be used as a reactor fuel or in weapons.

VITRIFICATION - To transform into a glassy substance by heat and fusion.

WIND ENERGY - The ability to do work (e.g., create electricity) using moving air (wind).

*U.S. GOVERNMENT PRINTING OFFICE: 1978 281-128/704 1-3