United States General Accounting Office

GAO

Briefing Report to Congressional Requesters

August 1988

NUCLEAR WASTE

Quarterly Report on DOE's Nuclear Waste Program As of June 30, 1988

043120

GAO/RCED-88-204BR

GAO

United States
General Accounting Office
Washington, D.C. 20548

Resources, Community, and
Economic Development Division

B-202377

August 29, 1988

The Honorable J. Bennett Johnston
Chairman, Committee on Energy
and Natural Resources
United States Senate

The Honorable James A. McClure
Ranking Minority Member
Committee on Energy and Natural Resources
United States Senate

On March 26, 1984, you requested that we provide quarterly status reports on the Department of Energy's (DOE) implementation of the Nuclear Waste Policy Act of 1982 (NWPA). The act established a national program and policy for safely storing, transporting, and disposing of nuclear waste. As part of this program, DOE is required to investigate a site at Yucca Mountain, Nevada and, if it determines that the site is suitable, recommend it to the President for a nuclear waste repository.

This briefing report addresses key nuclear waste program activities occurring in the quarter ending June 30, 1988, and provides some discussion of related activities that occurred in July 1988.

NRC STAFF ISSUE FINAL COMMENTS ON YUCCA MOUNTAIN DRAFT SITE CHARACTERIZATION PLAN

On January 8, 1988, DOE issued a "consultation draft" of the Yucca Mountain site characterization plan to the Nuclear Regulatory Commission (NRC) and the state of Nevada for comment. The objective of this plan is to detail the steps DOE will take to obtain geologic and environmental data to determine the suitability of the site for a repository. DOE intends to revise the draft site characterization plan on the basis of comments received and to issue the final plan in December 1988.

On March 7, 1988, NRC staff provided DOE with a set of draft "point papers" discussing about 160 specific concerns resulting from its technical review of the draft plan, 5 of which were considered to be critically important. Subsequently, on the basis of information NRC obtained in DOE/NRC technical workshops and a further review of the

draft plan, NRC staff determined that no significant changes were needed in the draft point papers. Therefore, on May 11, 1988, NRC submitted final point papers to DOE for consideration in developing the final site characterization plan.

One of the five concerns NRC considered critically important pertained to DOE's conceptual modeling of the Yucca Mountain site, one to DOE's quality assurance plans for site characterization activities, and three to the exploratory shaft facility that DOE proposes to construct at the site. In its final point papers, NRC reiterated that these five concerns were considered to be of such immediate seriousness that site characterization work should not begin until they are satisfactorily addressed. The point papers suggest that failure to resolve the concerns in a timely manner could jeopardize or, at a minimum, delay repository licensing. (See sec. 1 for more details.)

NRC staff expressed the most concern about DOE's "failure to recognize the range of alternative conceptual models of the Yucca Mountain site that can be supported by the existing limited data base and that need to be considered in the development of testing programs." NRC believes that DOE needs to consider a range of uncertainties and alternative conceptual models in developing its site characterization program and should attempt to understand the site and the data necessary to reduce the uncertainties over which conceptual model is most appropriate for Yucca Mountain. NRC staff said that if DOE does not first resolve the conceptual modeling issue, early site characterization work could physically compromise DOE's ability to conduct future investigations necessary for repository licensing.

NRC staff made several recommendations to DOE on the conceptual modeling issue. According to NRC staff, DOE agreed to consider the recommendations and NRC will review the final plan to ensure that its concerns have been addressed satisfactorily.

Another concern reiterated by NRC staff in their final point papers is that DOE's progress in developing a quality assurance program for site characterization work is not adequate and is not in accordance with NRC licensing criteria. NRC staff said that they do not have a sufficient basis for confidence in DOE's program because (1) DOE had not provided all quality assurance documents for NRC review, (2) those documents reviewed do not fully comply with NRC

requirements, and (3) outstanding comments remain on the documents reviewed by NRC. The comments also reflect NRC staff's "lack of confidence" that various elements of DOE's quality assurance program are adequate and comply with NRC licensing criteria. These comments need to be resolved by DOE in a timely manner, according to NRC staff, to avoid having the reliability of data collected during site characterization challenged during NRC's licensing review. DOE subsequently provided additional information requested by NRC and met with NRC staff to discuss open quality assurance items. DOE also stated that it would not start new work in any program area until NRC has reviewed the quality assurance plan for that area and confirmed its proper implementation through audits. According to NRC staff's comments, these are necessary first steps toward resolution of NRC's concerns. (We are currently preparing a report which addresses DOE's progress in developing a quality assurance program that will meet NRC standards for site characterization work. We expect to issue that report in September 1988.)

NRC staff also raised three concerns involving DOE's plans for the exploratory shaft facility at the repository site. NRC staff said that DOE's draft plan does not (1) include sufficient conceptual design information on the exploratory shaft facility, (2) adequately consider the potentially adverse effects of locating the shafts in areas that may be subject to erosion and flooding, or (3) adequately consider the potential effects of DOE's proposed shaft penetration into the Calico Hills--an important geologic barrier between the repository and the groundwater table beneath it--on the site's waste isolation capability.

DOE nuclear waste program officials told us that the design information suggested by the NRC staff will be contained in a separate document to be released prior to the final site characterization plan. They also said that DOE believes it can demonstrate to NRC the appropriateness of the proposed locations described in the draft plan. In addition, DOE has decided to proceed cautiously and to defer a decision on whether it will disturb the Calico Hills waste barrier.

DOE RELEASES DRAFT 1988 MISSION PLAN AMENDMENT

NWPA requires DOE to prepare a mission plan providing an information base sufficient for making decisions in the nuclear waste program. DOE issued the nuclear waste program

mission plan in June 1985. In June 1988, DOE released a draft mission plan amendment to federal agencies, states, and others for comment. The purpose of the amendment is to inform the Congress of DOE's plans for implementing the waste management program as revised by the 1987 Amendments Act. In general, the draft amendment discusses DOE's (1) strategy and technical plans for an integrated waste management system, (2) plans for a program governing relations with affected governments, the public, and other organizations, and (3) management of the program. Comments on the draft amendment are due to DOE by August 29, 1988. After considering comments received, DOE plans to revise the Mission Plan amendment as appropriate and submit it to the Congress.

REORGANIZATION OF THE OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

The NWPA established the Office of Civilian Radioactive Waste Management (OCRWM) within DOE to direct the nuclear waste program. After passage of the 1987 amendments to the Nuclear Waste Policy Act, DOE determined that a reorganization of the office was warranted to more effectively implement the new direction of the waste program designated by the amendments. Subsequently, in April 1988 OCRWM was reorganized. In the new organization, increased emphasis is placed on quality assurance; facility licensing; integration of all components of the waste system; and interactions with affected governments, the public, and other organizations.

METHODOLOGY

To determine the status of the activities discussed in this briefing report, we interviewed OCRWM officials responsible for planning and managing the waste program. We also interviewed NRC officials regarding NRC's role in nuclear waste program activities discussed in this report. In addition, we reviewed DOE program documents, correspondence, and studies, as well as related NRC documents and correspondence. We also attended a DOE briefing of NRC's Advisory Committee on Nuclear Waste relating to the conceptual modeling issue, and the NRC/DOE technical workshops on quality assurance and the exploratory shaft facility in July 1988.

We discussed the facts presented here with cognizant DOE officials and incorporated their comments as appropriate. Our work was performed between April and July 1988.

- - - -

Section 1 of this briefing report discusses NRC's principal comments on the Yucca Mountain draft site characterization plan. Section 2 discusses DOE's draft mission plan amendment, and the reorganization of OCRWM.

We are sending copies of this briefing report to the Chairmen of the Senate Committee on Governmental Affairs, the House Committee on Government Operations, and the House Committee on Energy and Commerce; the Secretary of Energy; the Chairman, Nuclear Regulatory Commission; and other interested parties. If you have further questions, please contact me at (202) 275-1441.

Major contributors to this briefing report are listed in appendix II.

Keith O. Fultz
Senior Associate Director

CONTENTS

ABBREVIATIONS

DOE	Department of Energy
GAO	General Accounting Office
NRC	Nuclear Regulatory Commission
NWPA	Nuclear Waste Policy Act
OCRWM	Office of Civilian Radioactive Waste Management

SECTION 1

DEPARTMENT OF ENERGY ACTIVITIES DIRECTED TOWARD MEETING NUCLEAR WASTE LEGISLATIVE REQUIREMENTS DURING THE APRIL-JUNE 1988 QUARTER

BACKGROUND

The Nuclear Waste Policy Act of 1982 (NWPA) established a federal program for high-level radioactive nuclear waste management. NWPA's ultimate objective is the safe and permanent disposal of nuclear waste in one or more geologic repositories. NWPA required that the Department of Energy (DOE), in consultation and cooperation with affected states and Indian tribes, develop, site, construct, and operate one repository and select a site for a second repository.

On December 22, 1987, the Nuclear Waste Policy Amendments Act of 1987 was signed into law. The amendments, which were contained within the Budget Reconciliation Act for Fiscal Year 1988 (P.L. 100-203), make substantial changes to NWPA and the manner in which DOE conducts its nuclear waste disposal program. One of the most significant changes directs DOE to characterize the Yucca Mountain site and terminate all site-specific activities, except reclamation efforts, at two other candidate sites in Deaf Smith County, Texas, and Hanford, Washington, within 90 days. The amendments authorize a nuclear waste repository to be sited and constructed only at Yucca Mountain, subject to existing licensing requirements. In addition, the amendments authorize, with certain restrictions, siting and construction of a facility for storage of spent nuclear fuel--called a monitored retrievable storage (MRS) facility.

NRC STAFF ISSUE FINAL COMMENTS ON DRAFT YUCCA MOUNTAIN SITE CHARACTERIZATION PLAN

On January 8, 1988, DOE issued a "consultation draft" of the site characterization plan for Yucca Mountain to the Nuclear Regulatory Commission (NRC) and the state of Nevada. The plan details the steps DOE will take to obtain geologic and environmental data for the site. DOE intends to revise the draft plan on the basis of comments received and to issue the final plan in December 1988. It will then provide a 90-day period for public review of the plan, hold public hearings, and provide a 6-month period for the NRC to review and prepare an analysis of the plan.

In late January 1988, DOE explained and discussed the draft site characterization plan with representatives of the state of

Nevada and NRC. On March 7, 1988, NRC staff provided DOE with a set of draft "point papers" discussing specific concerns resulting from its technical review of the draft plan. The draft point papers included about 160 concerns, 5 of which NRC staff considered critically important to the site characterization program. One of the five concerns pertained to conceptual modeling, one to DOE's quality assurance plans for site characterization activities, and three to the exploratory shaft facility that DOE proposes to construct at Yucca Mountain. Subsequently, DOE and NRC staff held technical workshops in late March and mid-April. The first workshop was intended to ensure that DOE fully understood NRC staff concerns. The second one focused on the specific concern that DOE had not adequately considered alternative conceptual models of the Yucca Mountain site in developing site-testing programs.

On the basis of the information provided in the two workshops and additional review of the draft plan, NRC staff determined that no significant changes were needed in their draft point papers. Therefore, on May 11, 1988, the director of NRC's high-level waste management division submitted final point papers to DOE for consideration in revising the draft site characterization plan. In the final comments, the director again noted five "objections"--matters that NRC staff consider to be of such immediate seriousness to the site characterization program that DOE should not start site characterization work until they are resolved satisfactorily. NRC staff comments indicate that failure to resolve the objections in a timely manner could jeopardize repository licensing entirely, or at a minimum, present problems that may delay issuance of a repository construction authorization. Subsequently, in June and July, NRC and DOE staff held additional meetings to discuss NRC's concerns regarding DOE's quality assurance and exploratory shaft facility plans.

Inadequate Consideration of Alternative Conceptual Models

NRC staff's most fundamental technical concern with DOE's draft site characterization plan continues to be DOE's failure to recognize the range of alternative conceptual models of the Yucca Mountain site that can be supported by the existing limited data base and that need to be considered in the development of testing programs.[1] NRC believes that DOE needs to consider a range of uncertainties and alternative conceptual models in developing its site characterization program. Also, NRC believes DOE should attempt to better understand the site and the data necessary to

---

[1]Models are simplified representations of actual conditions and are used to simulate and evaluate the behavior of a geologic system at a potential repository site over a long period of time.

reduce the uncertainties about which conceptual model is most appropriate for Yucca Mountain. Further, NRC stated that unless DOE resolves these issues before it begins site characterization, early characterization work could disturb the site in such a way as to adversely affect DOE's ability to conduct further investigations deemed necessary for repository licensing purposes.

NRC staff made several recommendations to DOE relating to conceptual models for site characterization. The staff recommended that DOE (1) systematically and clearly identify a full range of alternative conceptual models and associated boundary conditions, (2) determine which tests would interfere with or preclude other important site characterization tests, with tests being performed in the appropriate sequence, and (3) give high priority to investigations with the greatest potential for resolving issues that could either make the site unlicensable or substantially change the site characterization program.

NRC also outlined actions DOE could take to respond to these recommendations. NRC stated that one possible approach would be for DOE to include in the final plan a series of systematic tables--with discussions and integrated across all technical disciplines--that focus on the repository performance objectives of NRC's licensing criteria and that

-- describe what is known or suspected about the present and future states of each element of the natural and engineered systems;

-- for each element, discuss the uncertainties and influence of any assumptions made in the description;

-- for each uncertainty, identify and assess the significance of alternative hypotheses, interpretations, or assumptions that are consistent with the existing data and their uncertainties;

-- for each hypothesis, identify information needs and investigations to discriminate between the alternatives; and

-- prioritize the investigations to avoid interference between tests and the need to resolve key issues early.

According to the NRC comments, the April 1988 technical workshop produced an open exchange of technical information and views between representatives of NRC, DOE, and the state of Nevada on alternative conceptual models and anticipated and unanticipated processes and events in identifying needed investigations. At this meeting, NRC staff recommended that DOE include in the final site characterization plan a "systematic treatment of alternative conceptual models, integrated across technical disciplines," and

suggested ways in which such information might be effectively presented in the plan. According to NRC staff, DOE agreed to consider the recommendations presented in the meeting in developing the final plan.

Officials from DOE's nuclear waste program told us that they believe DOE can eliminate the concerns by clarifying DOE's conceptual modeling approach in the final site characterization plan. In this regard, these officials said that DOE intends to provide a list of scenarios considered in its approach and the hypotheses to be tested, as well as the correlation of these scenarios and hypotheses to the testing program. These DOE officials told us that during the April workshop, NRC staff agreed that this approach would provide the necessary information and would eliminate their objection. Nevertheless, NRC staff's May 1988 final comments reflect a continued concern regarding the conceptual modeling issue.

Adequacy of DOE's Quality Assurance Program

Another objection reiterated by NRC staff in their final comments on DOE's draft site characterization plan relates to DOE's progress in developing quality assurance programs for site characterization activities. NRC's regulations require DOE to develop and conduct a quality assurance program for site characterization to demonstrate that work performed to determine the site's suitability is credible for making repository licensing decisions. NRC staff commented that they currently do not have a sufficient basis for confidence in the adequacy of DOE's program because (1) none of the quality assurance documents reviewed by NRC fully comply with applicable NRC regulatory requirements, (2) DOE had not provided NRC with all DOE and contractor quality assurance documents for review, and (3) outstanding comments remain on the documents that NRC has reviewed. NRC staff also stated that they have not been able to selectively verify, through independent audits, that an adequate quality assurance program is in place for site characterization. The final NRC point papers also include a number of comments reflecting NRC staff's "lack of confidence" that various elements of DOE's quality assurance program are adequate and in accordance with NRC criteria for licensing the repository. These comments need to be resolved by DOE in a timely manner, according to NRC staff, to avoid having the reliability and accuracy of data collected during site characterization subject to challenge during a future NRC licensing review.

According to NRC staff's final comments, at the March 1988 workshop, DOE committed to (1) submitting a quality assurance plan for DOE's Nevada repository project office, (2) providing NRC a schedule showing when it will submit the quality assurance plans of repository project contractors to NRC for review, and (3) meeting with NRC staff to discuss all open quality assurance items. DOE

also stated that it would not start new site characterization work until NRC has reviewed the quality assurance plan for that area and confirmed its proper implementation through audits. According to NRC staff's comments, these commitments are necessary first steps toward resolution of NRC's quality assurance concerns.

In June 1988 DOE and NRC officials met to discuss the actions that each agency must successfully complete before NRC can independently confirm that DOE's quality assurance program is adequate. These actions included the following:

-- NRC's review and acceptance of numerous quality assurance plans developed by DOE headquarters, the Nevada project office, and project contractors. According to NRC, its reviews will be conducted after DOE headquarters has determined that the plans meet regulatory requirements and good quality assurance practices.

-- Observations of DOE audits by NRC staff to ensure that each DOE organization, including project contractors, is properly implementing the quality assurance plans.

-- Reiterations of these two steps until DOE and NRC concur that each DOE organization's quality assurance plan is acceptable and is being implemented properly.

NRC staff also provided DOE with a schedule indicating the expected time required for NRC to review quality assurance plans and observe DOE quality assurance audits. The schedule was provided to help DOE develop an overall plan and set milestones for receiving NRC's acceptance of DOE's quality assurance program. NRC indicated, for example, that its review of each quality assurance plan would take 1 month if the plans are of high quality and are submitted on a phased basis. NRC also indicated that, in general, two observations of each project organization will be required to accept the organization's quality assurance program if no major problems are found. Also, NRC staff have subsequently stated that they cannot perform more than two observation audits per month.

According to NRC's schedule, it could be in a position to accept the adequacy of DOE's quality assurance program by mid-1989 "under best case conditions." However, a June 24, 1988, NRC letter documenting the earlier meeting addresses NRC's concern that the goal of having an acceptable quality assurance program in place prior to beginning site characterization "is not consistent with DOE's current schedules" calling for exploratory shaft construction to begin in mid-1989.

To date, NRC has not approved any DOE or project contractor quality assurance plans for the repository program. The agencies have agreed to focus their efforts on one quality assurance plan,

that of the Nevada project office. Once finalized and accepted by NRC, the plan will serve as the "baseline" for revising DOE's headquarters, project office, and contractor plans to meet regulatory standards. DOE submitted the Nevada project office quality assurance plan to NRC in May 1988.

DOE and NRC met on July 7 and 8, 1988, in part, to discuss NRC staff comments on the project office plan. As a result of these discussions, DOE agreed to revise portions of the plan and to resubmit it for NRC's formal approval. If NRC finds it acceptable, NRC will prepare and publish a safety evaluation report formally indicating that it has accepted the plan. According to NRC staff, the report will take about 2 weeks to prepare. However, NRC staff indicated that they will begin preparing the evaluation report on the basis of oral understandings reached at the meeting and that they will confirm that the plan has been revised adequately when it is resubmitted by DOE.

At the July meeting, DOE submitted its schedule for (1) releasing the remaining quality assurance program plans for NRC's review and acceptance and (2) providing opportunities for NRC to assess the program. DOE's schedule provides time frames for NRC's observations of DOE audits so that NRC can independently confirm that DOE and its contractors are adequately implementing their quality assurance programs. In general, the schedule anticipates one NRC observation per month in the period between July and November 1988. Thereafter, the schedule identifies about two major audit observations per month between January and April 1989. Three NRC audit observations completed between February and April 1988 will also count toward the total number of observations NRC intends to perform to assess DOE's program prior to site characterization. However, NRC staff cautioned DOE that they may need to perform more than two observations of certain project participants if major problems are detected. DOE officials reiterated that they would not start new site characterization work until NRC concurs that the related quality assurance program is adequate for beginning site characterization work.

DOE's schedule envisions NRC acceptance of three quality assurance programs in February 1989 followed by acceptance of 6 additional programs between March and May 1989. A senior NRC management official present for the closeout of the July 7-8 meeting informed DOE that while DOE's schedule of actions necessary to receive NRC's acceptance of DOE's quality assurance program is logical, it is also very tight and likely to slip beyond mid-1989, when DOE plans to begin shaft construction.

At the July 1988 meeting, DOE and NRC officials also discussed outstanding quality assurance issues identified by the two agencies over the last several years. As a result of the meeting, the agencies "closed" all but 11 of the approximately 130 outstanding issues. Many of the issues were considered obsolete because they

related to NRC's review of previous quality assurance documents that DOE will revise and resubmit for NRC's review and approval. Other issues were closed by NRC acceptance of DOE's strategy for resolving the concern, subject to DOE's submitting adequate supporting documentation. Further, some issues relating to the adequacy and effectiveness of DOE and project contractor quality assurance programs were closed out with the understanding that if NRC staff find similar problems in future audit observations, the problems will again be carried as open items requiring DOE action prior to NRC's acceptance of the programs.

The agencies agreed that 8 of the 11 outstanding issues must be satisfactorily resolved to achieve a qualified quality assurance program before new site characterization work begins. Other issues may also be added to the list of outstanding issues if NRC finds problems in the documents it reviews or in the DOE audits it observes.

Plans for Exploratory Shaft Facility

NRC staff also identified three objections involving DOE's plans for the exploratory shaft facility at the repository site. First, NRC staff commented that DOE's draft plan does not include the conceptual design information on the proposed exploratory shaft facility needed to allow NRC to evaluate whether proposed tests will interfere with each other or whether construction operations in the two shafts will interfere with these tests. Second, NRC staff commented that the draft plan does not adequately consider the potentially adverse effects of locating the exploratory shafts in areas that may be subject to erosion and flooding, including potentially significant effects on the site's waste isolation capability and DOE's ability to adequately characterize the site. Third, NRC staff commented that DOE's proposed shaft penetration into the Calico Hills--an important geologic barrier between the repository and the groundwater table beneath it--may also negatively affect the site's waste isolation capability. According to NRC staff, DOE has not evaluated whether the activities proposed may irreparably damage the Calico Hills' ability to function as a waste isolation barrier.

To address these concerns, NRC staff recommended that DOE include in the site characterization plan:

-- Consideration of plans for characterizing Calico Hills to the extent necessary without having to penetrate and damage portions of this barrier. If alternative plans cannot be developed, DOE should justify the need for destructive testing of Calico Hills and analyze its consequences.

-- Information on exploratory shaft facility conceptual design in more detail and in a consistent fashion, and

discuss a strategy to minimize potential interference between investigations.

NRC also recommended that before DOE finalizes the locations of the shafts, it should consider the

-- effects of surface water infiltration and flooding,

-- effects of vertical and lateral erosion,

-- potential for seals to become ineffective during the postclosure phase,

-- future potential changes in the natural geologic processes,

-- potential adverse effects on the isolation capability of the site, and

-- potential effects on the ability to characterize the site.

DOE nuclear waste program licensing and siting officials told us that the detailed design information suggested by NRC staff will be contained in a separate document to be released prior to the final site characterization plan. They also said that DOE believes it can demonstrate to NRC the appropriateness of the proposed locations described in the draft plan. In addition, DOE has decided to proceed cautiously and to defer a decision on whether it will disturb the Calico Hills waste barrier.

Additional NRC Staff Concerns

Included in NRC's final point papers are three comments relating to DOE positions that NRC staff consider to be inconsistent with NRC repository licensing requirements. According to the comments, these inconsistencies could result in DOE's not having necessary information to adequately demonstrate, when applying for a repository construction license, that natural and engineered barriers comply with NRC regulatory requirements.

One concern is that DOE's interpretation of the term "substantially complete containment" and the design objectives for (1) waste package performance and (2) radionuclide release from the engineered barrier system are inconsistent with NRC licensing criteria. Therefore, the NRC staff said the interpretation is inappropriate to guide the waste package testing and design program. Another NRC concern involves DOE's statement in the draft plan that it would not start testing seal components and placement methods until after the submission of the license application. NRC staff believe that this would result in insufficient data for NRC to evaluate the application. Finally, NRC staff are concerned that the draft plan lacks sufficient

information about the performance confirmation program. NRC licensing criteria require that the performance confirmation program be started during site characterization.

NRC staff have proposed a number of interactions with DOE on some of the staff's major concerns, such as exploratory shaft location and design, and interpretation of "substantially complete containment" in NRC licensing criteria. According to NRC staff's comments, DOE agreed that those interactions are desirable and committed itself to "an early response on how many of them could be scheduled in the time available prior to release of the site characterization plan."

SECTION 2

OTHER NUCLEAR WASTE PROGRAM ACTIVITIES DURING THE QUARTER

During the quarter ending June 30, 1988, two additional significant events occurred in DOE's nuclear waste program: (1) DOE released for comment a draft amendment to the nuclear waste program mission plan and (2) the Office of Civilian Radioactive Waste Management (OCRWM) was reorganized.

DOE RELEASES DRAFT 1988 MISSION PLAN AMENDMENT

NWPA requires DOE to prepare a mission plan providing an information base sufficient for making decisions in the nuclear waste program. DOE issued the nuclear waste program mission plan in June 1985. In June 1988, DOE released a draft mission plan amendment for comment. The purpose of the amendment is to inform the Congress of DOE's plans for implementing the waste management program as revised by the 1987 Amendments Act. In general, the draft amendment discusses DOE's (1) strategy and technical plans for an integrated waste management system, (2) plans for a program governing relations with affected governments, the public, and other organizations, and (3) management of the program. Comments on the draft amendment are due to DOE by August 29, 1988. After considering comments received, DOE plans to revise the Mission Plan amendment as appropriate and submit it to the Congress.

In discussing DOE's strategy for developing an integrated system, the draft amendment also discusses potential actions for accelerating the program schedule, contingencies, and technical questions that have not yet been resolved. Among the system enhancements discussed in the draft amendment is the potential for accelerating operation of the MRS facility authorized by the 1987 amendments. The unresolved questions relate to repository development and other technical issues.

Revised MRS Plans

The amendments act authorized the siting, construction, and operation of an MRS, subject to certain conditions. The restrictions imposed by the act include the following:

-- The MRS site may not be selected until DOE has recommended approval of the repository site to the President.

-- MRS construction may not begin until NRC has authorized construction of the repository.

-- A Monitored Retrievable Storage Review Commission established by the amendments act must recommend to the

Congress whether an MRS facility should be included in the nuclear waste management system.

According to the draft Mission Plan amendment, an MRS facility will begin accepting waste in 2003 if (1) DOE obtains the construction authorization for the repository from NRC in 1998 and (2) DOE constructs the MRS facility in a single phase and the facility is able to perform all of the functions described in DOE's 1987 MRS proposal. The MRS facility proposed by DOE was assumed to include all the facilities and equipment required to (1) receive and unload spent fuel shipped from reactors, (2) consolidate the fuel into more compact arrays, (3) load the consolidated spent fuel into canisters, (4) temporarily store the canisters at the MRS site, (5) retrieve the canisters from storage, and (6) ship them to the repository. Furthermore, as originally proposed by DOE, all of these facilities and equipment were to be constructed and operational before any spent fuel was received at the MRS site.

Now, however, DOE believes that it may be possible to shorten the time between the start of MRS construction and the start of waste acceptance by developing the MRS facility in two phases, with the first phase limited to those facilities necessary to receive and store spent fuel. These facilities could be constructed relatively quickly, according to the draft amendment. The second phase would provide all other MRS spent fuel preparation and shipping facilities. DOE believes that this approach could permit it to begin accepting waste at the MRS facility before the currently scheduled date of 2003. DOE states that it will conduct studies to estimate the time that could be saved and the benefits and cost effects of a phased approach to developing an MRS facility.

DOE is also planning to reevaluate the functions of the MRS facility to determine its optimal role in the waste management system. This evaluation will begin in fiscal year 1988 and will be completed in fiscal year 1989. Among the factors to be evaluated are the conditions imposed by the amendments act as well as the location of the repository site, which is assumed to be Yucca Mountain. DOE plans to conduct generic engineering and design studies for alternative MRS designs, waste-packaging requirements, waste acceptance schedules, and functional requirements. DOE also plans to conduct studies to determine optimal process flows and define interactions with the repository and the transportation system. DOE plans to begin activities toward developing the "definitive" MRS design as early as possible.

Unresolved Technical Issues

The draft Mission Plan amendment also notes a number of key technical questions that remain to be resolved about specific aspects of the waste management program. These issues include: (1) the development of the repository in two phases, (2) the number

of repositories to be developed, and (3) technical and engineering issues.

Two-Phase Repository Development

DOE's current plans call for development of the repository in two phases. Construction of the repository would start in 1998, and phase 1 operations would begin approximately 5 years later, in 2003. Phase 2 operations would begin in 2006. The phased development of the repository was included in the program baseline before the authorization of the MRS facility. Its purpose was to allow the earliest possible acceptance of spent fuel at the repository. DOE believes that it is now appropriate to review this approach, taking into account the schedule and the capabilities of the MRS facility. If this review indicates that a single-phase development of the repository is preferable, then the program baseline will be modified.

Number of Repositories

DOE does not yet know whether a second repository will be needed. According to DOE's draft Mission Plan amendment, the need for a second repository will depend on the quantity of wastes requiring disposal and the capacity of the first repository site.

The projections of spent fuel quantities have been decreasing; the latest estimates used as DOE's current basis for planning indicate, according to the amendment, that the total quantity of spent fuel that will be discharged from commercial nuclear power plants now operating or in active construction will be about 87,000 metric tons.[1] The quantity of defense and commercial high-level waste that is currently expected to require disposal by the year 2020 is about 9,400 metric tons. According to DOE, the Yucca Mountain site has the potential capacity to accept at least 70,000 metric tons of waste; however, it will only be possible to determine the total quantities of waste that could be accommodated at that site after site characterization is completed.

Technical and Engineering Issues

The draft amendment notes that a variety of technical issues must be addressed during the development of the waste management system, including

-- allocation of system functions to the MRS facility, and if necessary, to nuclear power plant sites;

---

[1]Previously, DOE used a more optimistic forecast of nuclear-generated electricity which, for 1987, resulted in a spent fuel projection totalling 106,300 metric tons of waste.

-- whether spent fuel should be consolidated and, if so, where the consolidation should be performed;

-- the degree to which new technologies (for example, robotics) should be included in the design of waste management facilities;

-- methods for making the system sufficiently flexible to accommodate wide fluctuations in operating parameters;

-- waste acceptance rates that will meet the needs of utilities and DOE's defense waste program while allowing the repository to maintain a reasonable waste emplacement schedule; and

-- the amount of buffer storage capacity that should be built into the system and where it should be provided.

According to DOE, these and other technical issues will be resolved through total-system studies conducted to ensure that the system as a whole will function effectively and efficiently under a wide variety of operating conditions.

REORGANIZATION OF THE OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

The Nuclear Waste Policy Act established the OCRWM within DOE to direct the nuclear waste program. After passage of the Nuclear Waste Policy Amendments Act, DOE determined that a reorganization of the office was warranted to more effectively implement the new direction of the waste program designated by the act. Subsequently, in April 1988 OCRWM was reorganized. In the new organization, increased emphasis is placed on quality assurance, facility licensing, systems integration, and external interactions.

The reorganization established four functional program offices and an Office of Quality Assurance.

-- The Office of Program Administration and Resources Management is responsible for administrative management and support services; cost and scheduling activities; budget preparation; financial management; grants and financial assistance programs and benefits agreements; land acquisition; procurement activities, including the management and operating contract for systems engineering; development and management support; records management; and utility contracts.

-- The Office of Facilities Siting and Development is responsible for site characterization of the Yucca Mountain

site and the siting of an MRS facility. The office is also responsible for the design and development of the repository, MRS facility, and waste package; socioeconomic planning; and consultation and cooperation.

-- The Office of Systems Integration and Regulations is responsible for overall systems integration; facility licensing; regulatory and environmental compliance; transportation systems development and operation; risk, safety, and performance assessment; and spent fuel storage activities.

-- The Office of External Relations and Policy is responsible for interactions with the newly created MRS Review Commission and the Nuclear Waste Technical Review Board, as well as continuing external interactions with the state, local, and Tribal governments; international organizations; the media; the public; and the Congress. In addition, this office coordinates development of program policy and strategy.

-- The new Office of Quality Assurance reports directly to the Director, OCRWM. The purpose of this office is to ensure development and implementation of an effective quality assurance program to demonstrate the technical performance of the waste management system.

PRINCIPAL GAO PRODUCTS ON THE NUCLEAR WASTE PROGRAM

Congressional Reports

Nuclear Waste: Issues Concerning DOE's Postponement of Second Repository Siting Activities (GAO/RCED-86-200FS, July 30, 1986).

Nuclear Waste: Institutional Relations Under the Nuclear Waste Policy Act of 1982 (GAO/RCED-87-14, Feb. 9, 1987).

Nuclear Waste: Status of DOE's Nuclear Waste Site Characterization Activities (GAO/RCED-87-103FS, Mar. 20, 1987).

Nuclear Waste: Status of DOE's Implementation of the Nuclear Waste Policy Act (GAO/RCED-87-17, Apr. 15, 1987).

Nuclear Waste: DOE Should Provide More Information on Monitored Retrievable Storage (GAO/RCED-87-92, June 1, 1987).

Nuclear Waste: A Look at Current Use of Funds and Cost Estimates for the Future (GAO/RCED-87-121, Aug. 31, 1987).

Nuclear Waste: Information on Cost Growth in Site Characterization Cost Estimates (GAO/RCED-87-200FS, Sept. 10, 1987).

Nuclear Waste: DOE's Handling of Hanford Reservation Iodine Information (GAO/RCED-88-158, May 25, 1988).

Reports to Agency Officials

Nuclear Waste: Department of Energy's Program for Financial Assistance (GAO/RCED-86-4, Apr. 1, 1986).

Nuclear Waste: DOE Should Base Disposal Fee Assessment on Realistic Inflation Rate (GAO/RCED-88-129, July 22, 1988).

APPENDIX II

MAJOR CONTRIBUTORS TO THIS BRIEFING REPORT

RESOURCES, COMMUNITY, AND ECONOMIC DEVELOPMENT DIVISION, WASHINGTON, D.C.

Keith O. Fultz, Senior Associate Director (202) 275-1441
Dwayne E. Weigel, Group Director
Vincent P. Price, Evaluator-in-Charge
Kathleen J. Turner, Evaluator
Earl P. Williams, Jr., Writer-Editor

(301817)

Requests for copies of GAO reports should be sent to:

U.S. General Accounting Office
Post Office Box 6015
Gaithersburg, Maryland 20877

Telephone 202-275-6241

The first five copies of each report are free. Additional copies are $2.00 each.

There is a 25% discount on orders for 100 or more copies mailed to a single address.

Orders must be prepaid by cash or by check or money order made out to the Superintendent of Documents.

United States
General Accounting Office
Washington, D.C. 20548

Official Business
Penalty for Private Use $300

First-Class Mail
Postage & Fees Paid
GAO
Permit No. G100