



**THE REPORT TO
THE PRESIDENT
AND THE CONGRESS
BY THE
SECRETARY OF ENERGY
ON THE NEED FOR
A SECOND REPOSITORY**

December 2008

U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Washington, D.C.



INTENTIONALLY LEFT BLANK

CONTENTS

1.	FINDING AND RECOMMENDATION	1
2.	EXECUTIVE SUMMARY	1
3.	HISTORY OF THE NWPA.....	4
4.	FUNDING FOR SNF AND HLW DISPOSAL ACTIVITIES.....	4
5.	WASTE STREAM FOR DISPOSAL.....	5
6.	THREE ALTERNATIVES CONSIDERED	7
6.1	REMOVING THE STATUTORY LIMIT OF 70,000 MTHM FOR YUCCA MOUNTAIN	7
6.2	BEGINNING THE PROCESS OF SITING, DESIGNING, LICENSING, AND CONSTRUCTING A SECOND REPOSITORY AS SOON AS POSSIBLE.....	9
6.3	DEFERRING THE DECISION	12
7.	POTENTIAL LEGISLATIVE ACTIONS	13
8.	CONCLUSIONS.....	14

FIGURES

1. Historical and Projected Commercial SNF Generation Inventory from Existing Fleet (if all currently operating reactors operate to the end of their licensed lifetimes) 6

2. Potential Repository Emplacement Areas (after Mansure and Ortiz)..... 9

3. Map of the United States Illustrating First Repository Program Sites, Second Repository Program Areas Under Consideration, and Shale Deposits Potentially Suitable for a Repository..... 12

THE REPORT TO THE PRESIDENT AND THE CONGRESS BY THE SECRETARY OF ENERGY ON THE NEED FOR A SECOND REPOSITORY

1. FINDING AND RECOMMENDATION

The Nuclear Waste Policy Act of 1982, as amended (NWPAct), sets a statutory capacity limit of 70,000 metric tons heavy metal (MTHM) for the Nation's first spent nuclear fuel (SNF) and high-level radioactive waste (HLW) geologic repository, which has been designated by the Congress and the President to be sited in Yucca Mountain in Nye County, Nevada. Under the NWPAct, this statutory limit on the amount of SNF and HLW to be disposed of at Yucca Mountain will remain in place until a second repository is in operation. The inventories of commercial and Federal Government SNF and HLW in the United States are projected to exceed 70,000 MTHM by 2010, therefore additional repository capacity is needed. The 70,000 MTHM statutory limit for the first repository is not based on any technical considerations related to Yucca Mountain, and studies indicate that the repository layout at Yucca Mountain can be expanded to accommodate three times, or more, the current statutory limit of 70,000 MTHM. This capacity would be sufficient for disposing of the SNF from the existing fleet of reactors, even if all of their licenses are extended to allow them to operate for 60 years. If the number of nuclear power plants grows, a second repository may ultimately be needed beyond expansion of Yucca Mountain. The Secretary of Energy recommends that, consistent with legislation that the Administration proposed in 2007, Congress act promptly to remove the statutory limit of 70,000 MTHM for the Yucca Mountain repository, thereby permitting a deferral of a decision regarding the need for a second repository. This deferral allows for the decision regarding a second repository to consider how much additional capacity is needed, whether or not recycling of SNF is appropriate and should be implemented, and what waste management approaches for the additional SNF may be most appropriate.

2. EXECUTIVE SUMMARY

The Nuclear Waste Policy Act of 1982, as amended (NWPAct), establishes a process for the siting, construction and operation of one or more national repositories for permanent disposal of the Nation's spent nuclear fuel (SNF) and high-level radioactive waste (HLW). In 1987, after the Department of Energy (the Department or DOE) had conducted studies of nine potential repository sites located throughout the United States, Congress amended the NWPAct and selected the Yucca Mountain site in Nye County, Nevada as the only site for further study for the first national repository. In 2002, Congress passed and the President signed Public Law 107-200, which approved Yucca Mountain as the site for that repository. On June 3, 2008, the

Department submitted a license application to the Nuclear Regulatory Commission (NRC) seeking construction authorization for the repository at Yucca Mountain.

This report is prepared pursuant to Section 161 of the NWPAⁱ, which requires the Secretary of Energy (the Secretary) to report to the President and to the Congress on or after January 1, 2007, but not later than January 1, 2010, on the need for a second repository. In preparing this report, the Department has considered the relevant statutory provisions of the NWPA, the current and projected inventories of SNF and HLW, and the projected capacity of the proposed Yucca Mountain repository.

In particular, the Department has considered the provisions of the NWPA which currently set a statutory capacity limit on the amount of commercial and government-owned SNF and HLW that can be emplaced in the Nation's first repository to 70,000 metric tons of heavy metal (MTHM), until a second repository is in operation. Specifically, Section 114(d) of the NWPAⁱⁱ "prohibit[s] the emplacement in the first repository of a quantity of spent fuel containing in excess of 70,000 metric tons of heavy metal or a quantity of solidified high-level radioactive waste resulting from the reprocessing of such a quantity of spent fuel until such time as a second repository is in operation."

The Department has also considered President Reagan's decision in 1985, pursuant to Section 8 of the NWPA, to use the disposal capacity of the first repository for the disposal of HLW, including DOE and U.S. Navy SNF, resulting from national defense activities. Subsequent to President Reagan's decision, the Department established a policy to allocate ninety percent (90%) of the first repository capacity (in MTHM) to civilian SNF and ten percent (10%) of the repository capacity to Department-managed SNF and HLW. Accordingly, 63,000 MTHM of the 70,000 MTHM statutory limit is allocated to civilian waste and 7,000 MTHM of the 70,000 MTHM statutory limit is allocated to national defense waste.

The Department has considered that there is currently more than 58,000 MTHM of commercial SNF in storage in the United States, and the total inventory of commercial SNF continues to increase at a rate of about 2,000 MTHM per year. DOE expects that, by 2010, commercial nuclear power plants will have generated the entire amount of commercial SNF (that is, 63,000 MTHM) that is allocated for disposal in the Yucca Mountain repository under the current statutory cap. Assuming all existing operating nuclear reactors in the United States request license extensions from the NRC to operate for 60 years, the amount of commercial SNF from these reactors in the United States requiring permanent disposal is projected to be approximately 130,000 MTHM. Further, there is currently approximately 12,800 MTHM of DOE SNF and HLW, including naval SNF, in storage at government sites. This quantity exceeds the 7,000 MTHM of national defense waste allocated for disposal in the Yucca Mountain repository. Additionally, nuclear utilities have expressed their intention to file, by the end of 2010, license applications seeking approval for the construction and operation of 34 new nuclear reactors. If these reactors become operational, they would substantially increase the amount of nuclear generation and will result in additional spent nuclear fuel requiring disposal. **Unless Congress raises or eliminates the current statutory capacity limit of 70,000 MTHM in the NWPA, the Nation will need a second repository for SNF and HLW.**

To address this need, the Department has further considered the following three alternatives and possible ways to move forward:

- (1) Remove the statutory limit of 70,000 MTHM for Yucca Mountain and dispose of currently projected quantities of SNF and HLW at the Yucca Mountain repository;
- (2) Begin the process of siting, designing, licensing and constructing a second repository as soon as possible so it will be ready to receive SNF and HLW by the time 70,000 MTHM has been emplaced in the Yucca Mountain repository; or,
- (3) Defer the decision and prolong the time commercial SNF generated after 2010 will be stored at reactor sites, as well as the time DOE SNF and HLW will be stored at DOE sites.

In addressing the first alternative of removing the statutory limit and placing more than 70,000 MTHM of SNF and HLW at Yucca Mountain, the Department has considered the additional area available for disposal at Yucca Mountain. The 70,000 MTHM statutory limit that Congress established in 1982 for the first repository is not based on any technical considerations related to Yucca Mountain. Studies indicate that three times, or more, this statutory limit could be accommodated by expanding the repository layout at Yucca Mountain.

In addressing the second alternative of developing a second repository, the Department has considered previous work performed to identify candidate repository sites. That work shows that all states in the contiguous United States have an identified potential site or area that could be considered for a second repository.

In considering the third alternative of deferring a decision, the Department has considered the impacts of leaving uncertain the disposal path for the commercial SNF and national defense waste in excess of the current 70,000 MTHM statutory limit. Each year a decision is deferred, the Federal Government will incur additional financial liabilities. In addition, deferral of a decision increases the possibility the Department will be unable to honor, in a full and timely manner, its commitments to states that currently store national defense HLW and SNF within their borders—including Washington, Idaho, and South Carolina, among others.

Finally, the Department has also considered legislative actions that would be needed to implement the alternatives. The first alternative would require removing the current statutory limit of 70,000 MTHM, as the Administration has proposed previously. The second alternative would require legislative action to specify the process for siting, design, licensing and constructing a second repository. The third alternative would require Congressional direction to the Department on how to address the damages resulting from the delay and on what to do with the HLW and SNF that could not be placed in Yucca Mountain.

As set forth more fully below, the Secretary recommends that the preferred course of action is legislative removal of the statutory capacity limit of 70,000 MTHM. Removal of this statutory limit would defer the urgency in evaluating the issues associated with a second repository.

3. HISTORY OF THE NWPA

When first enacted in 1982, the NWPA provided for the development by the Department of two geologic repositories. Specifically, the NWPA directed the Department to identify three candidate sites for the first repository and to conduct a multi-year evaluation of each of the sites. The site characterization process was to be repeated for a second set of sites for the second repository. The Department was directed to issue general guidelines for the program, which were finalized in December 1984 as General Guidelines for the Recommendation of Sites for Nuclear Waste Repositories (10 CFR Part 960). In addition, the NWPAⁱⁱⁱ established a statutory limit on the quantity of SNF that could be emplaced in the first repository until such time as a second repository is in operation. This statutory limit is 70,000 MTHM, or a comparable quantity of solidified HLW resulting from the reprocessing of such a quantity of SNF.

Through passage of the Nuclear Waste Policy Amendments Act of 1987 (the Amendments Act), Congress redirected the Department to focus its site characterization activities only at Yucca Mountain, Nevada. The Amendments Act also terminated site-specific activities at all candidate sites other than the Yucca Mountain site (i.e., the Deaf Smith County, Texas and Hanford, Washington sites). The Amendments Act also banned future site-specific activities with respect to a second repository unless and until Congress specifically authorizes and appropriates funds for such activities, and requires the Secretary to report to the President and to Congress on or after January 1, 2007, but not later than January 1, 2010, on the need for a second repository. The Amendments Act did not modify the statutory capacity limit of 70,000 MTHM for the first repository.

In 2002, in accordance with the framework established by the NWPA, as amended, the Secretary recommended the Yucca Mountain site to the President for development as a repository. The President accepted the Secretary's recommendation and submitted the recommendation to Congress. Subsequently, the Governor of Nevada submitted a Notice of Disapproval. Congress passed a joint resolution approving the Yucca Mountain site for development and the President signed the resolution into law (Public Law 107-200).

4. FUNDING FOR SNF AND HLW DISPOSAL ACTIVITIES

The NWPA authorizes the Secretary to enter into contracts with utilities for the acceptance and disposal of SNF. The terms for these contracts, which are known as the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract), are set forth in 10 CFR Part 961. The Department has executed contracts with individual utilities operating the nation's current fleet of nuclear power plants. The Standard Contract provides that, in return for the payment of fees, the Department will take title to and dispose of SNF covered by the contract as expeditiously as practicable following commencement of operation of a repository, beginning not later than January 31, 1998. The failure of DOE to begin acceptance of SNF under the contracts has been the subject of litigation between DOE and the utilities.

The Standard Contract also provides for the payment of fees into the Nuclear Waste Fund to fund activities associated with the disposal of civilian SNF. Those fees have to date been set at 1.0 mill (one-tenth of one cent) per kilowatt-hour, on the commercial generation of nuclear power by contract-holders. The Secretary must review the fee annually to determine its

adequacy, and propose adjustments, as needed, to ensure full cost recovery. In addition, costs associated with the disposal of DOE SNF and HLW are paid by appropriations of general revenue funds.

5. WASTE STREAM FOR DISPOSAL

The SNF and HLW planned for disposal in Yucca Mountain consists of two principal types: 1) commercial SNF generated by nuclear power reactors and 2) DOE SNF and HLW. The inventory of material at DOE sites is essentially fixed, and consists principally of DOE SNF resulting from government nuclear weapons programs, research reactors, reactor prototypes, and nuclear-powered naval vessels; and HLW created from reprocessing commercial and DOE SNF. Only the inventory of naval SNF, which is critical to the Nation's national security needs, continues to increase materially. The inventory of material at DOE sites is approximately 2,500 MTHM of DOE SNF and approximately 10,300 MTHM of DOE HLW, for a total of approximately 12,800 MTHM^{iv}. This exceeds the 7,000 MTHM portion of the 70,000 MTHM statutory limit for Yucca Mountain that is currently allocated to DOE SNF and HLW.

The commercial SNF inventory, which includes commercial SNF generated by 104 operating reactors and 14 reactors that have ceased operation, currently is approximately 58,000 MTHM and is increasing by approximately 2,000 MTHM annually. It is also possible to make reasonable projections of the total amount of spent fuel that will be generated by the existing fleet. The major variable in making projections concerning future generation of commercial SNF from the existing fleet is the issuance of 20-year operating license extensions to many reactors (for a possible total lifetime of 60 years). As of January 2007, 47 license extensions had been granted. Figure 1 shows the historical and projected commercial SNF inventory if all currently operating reactors operate to the end of their licensed lifetimes (note that currently, no reactor has operated even to the end of its initial 40 year license). Projections are shown for a case that assumes only 47 reactor-life extensions and a bounding case that assumes all 104 operating reactors receive life extensions. The 47 reactor-life extension projection is approximately 109,300 MTHM, and the 104 life extension projection is approximately 130,000 MTHM. It should be noted that, regardless of the number of life extensions assumed, the current 63,000 MTHM portion of the 70,000 MTHM statutory limit for Yucca Mountain that is allocated to commercial SNF will be exceeded by 2010.

The projections used in preparing this report do not include any commercial SNF from the future operation of possible new reactors. The projections used in this report also do not take into account the possible effects of any decision to proceed with any of the reprocessing options being considered as part of the Global Nuclear Energy Partnership (GNEP) initiative. The current 70,000 MTHM statutory limit as defined in the NWPA pertains to the heavy metal content of the original fuel. As a result, from a repository capacity standpoint, it does not matter if SNF is emplaced as the original spent fuel rods or the SNF is reprocessed and only the resulting HLW is emplaced. Only the waste forms that originate from 70,000 MTHM can be emplaced. In any event, all reprocessing technologies under consideration as part of the GNEP initiative would produce wastes requiring disposal in a repository and moreover, deployment of reprocessing technologies would have little, if any, effect on the quantity of DOE SNF and HLW as they are not likely candidates for reprocessing.

It should be noted, however, that under a scenario where the number of future new nuclear plants grows substantially, the use of reprocessing technologies would extend the use of the Yucca Mountain repository, and if a second repository ultimately is necessary, would also prolong the use of that repository. Further, to the extent that reprocessing reduces or eliminates the need for retrievability of waste between the time it is emplaced in a repository and closure of that repository, this could result in increased operational efficiencies, lower costs for repository construction and operations, and open additional geologic media, such as salt formations, to consideration.

As far as the conclusions contained in this report are concerned, the projections of waste considered in this report are based on reasonable assumptions reflecting current policy, and speculation as to future policy has been limited to the extent practicable.

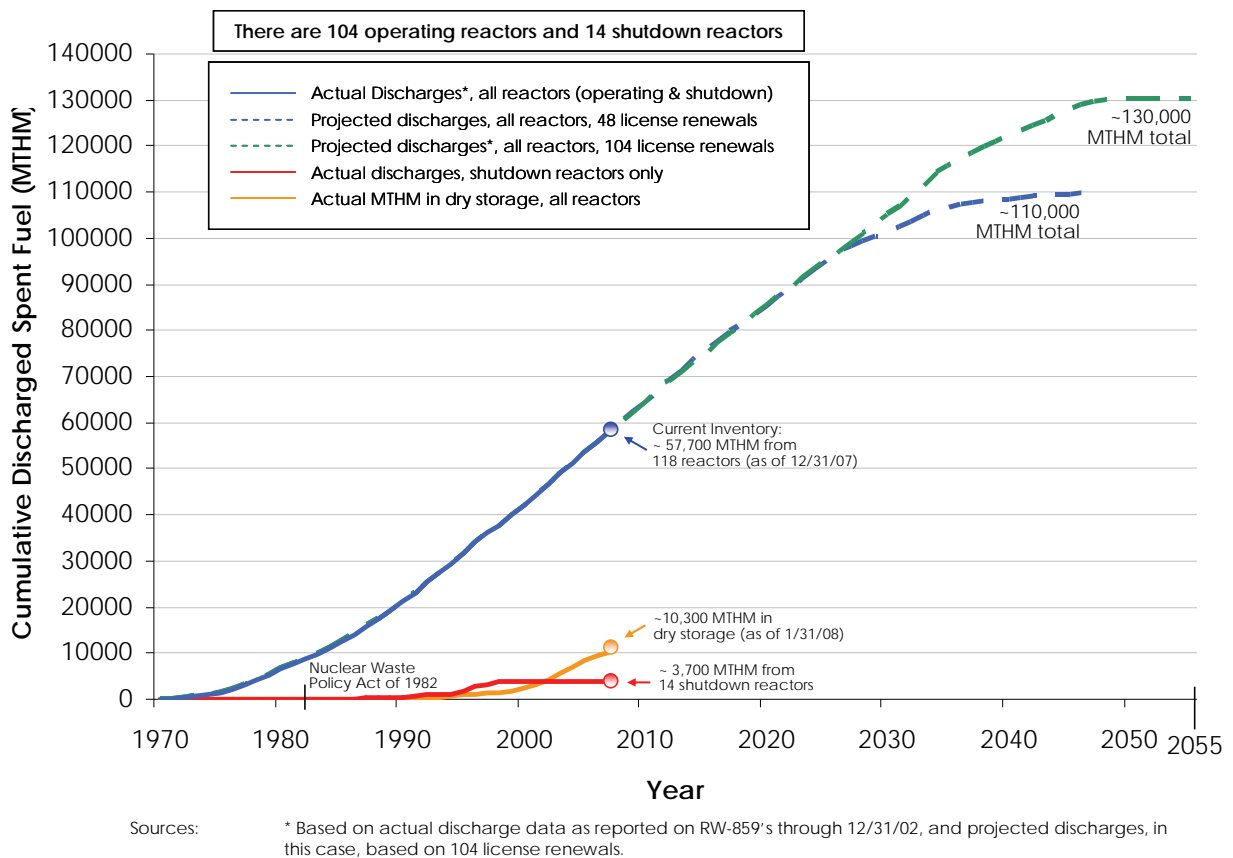


Figure 1. Historical and Projected Commercial SNF Generation Inventory from Existing Fleet (if all currently operating reactors operate to the end of their licensed lifetimes)

6. THREE ALTERNATIVES CONSIDERED

A repository at Yucca Mountain subject to the NWPA statutory capacity limit of 70,000 MTHM cannot accommodate the projected amount of 122,100 MTHM. The 63,000 MTHM allocation for commercial SNF within the 70,000 MTHM statutory capacity limit will be reached by SNF discharged by existing reactors by 2010, well before the Yucca Mountain repository begins operations. Accordingly, there is a need for additional repository capacity beyond the current statutory limit on the Yucca Mountain repository if the Department is to be able to carry out the mandate of the NWPA to provide for the disposal of defense and commercial SNF and HLW produced in the United States. If the statutory limit on the Yucca Mountain repository is not lifted, then a second repository will be needed.

The Department has considered three alternatives for addressing this need for disposal capacity beyond the 70,000 MTHM limit:

- Removing of the statutory limit of 70,000 MTHM for Yucca Mountain and disposal of currently projected quantities of SNF and HLW at the Yucca Mountain repository;
- Beginning the process of siting, designing, licensing and constructing a second repository as soon as possible so it will be ready to receive SNF and HLW by the time 70,000 MTHM has been emplaced in the Yucca Mountain repository; or
- Deferring the decision and prolonging the time commercial SNF generated after 2010 will be stored at reactor sites, as well as the time DOE SNF and HLW will be stored at DOE sites.

6.1 REMOVING THE STATUTORY LIMIT OF 70,000 MTHM FOR YUCCA MOUNTAIN

Lifting the statutory limit of 70,000 MTHM would provide a substantial increase in the capability of the Department to accept SNF and HLW for disposal without the need for a second repository. It would avoid the additional costs and timing uncertainties associated with an effort to site and develop a second repository. The Yucca Mountain repository would likely have sufficient capacity to dispose of the entire defense waste inventory plus the commercial SNF expected to be produced by the existing fleet of nuclear power reactors. The conclusion that removing the 70,000 MTHM limit on the Yucca Mountain repository can meet the currently projected needs for additional disposal capacity is based on studies indicating that Yucca Mountain has the physical capability to allow disposal of a much larger inventory. The 70,000 MTHM statutory limit on capacity of the first repository until a second repository is in operation is not based on any technical considerations related to the characteristics of possible repository sites or geologic media.

The NWPA provides no limit on the amount of SNF and HLW disposed of in the first repository after a second repository begins operation.

The Physical Capacity of Yucca Mountain

The 70,000 MTHM limit on the amount of waste that can be placed in the first repository is a statutory capacity limit, and the limit only applies until a second repository is in operation. If that statutory limit was removed, the amount of waste that could be placed in a Yucca Mountain repository would be a function of design constraints that address the heat load that the waste would introduce in the rock mass and the volume

The current repository layout encompasses 1250 acres. Past studies examined design layouts that encompass as much as 4200 acres; this is more than three times the area of the layout used to accommodate 70,000 MTHM.

of rock of sufficient quality to allow the design to meet the constraints. The heat load, which is a function of burn-up and age of the SNF, is dictated by which SNF is shipped to the repository (referred to as the waste stream), how the SNF is loaded in waste packages, whether the waste packages are aged prior to emplacement, and the spacing or sequencing of waste packages when emplaced. The length of ventilation time prior to repository closure is also a key parameter in determining the amount of waste that can be placed in a given volume of rock. The volume of rock is dictated by the geologic characteristics of the site.

As the design of the repository evolved, DOE undertook additional studies^v of potential expansion areas. Questions and comments related to both the capacity of Yucca Mountain and the types of waste that could be placed in a repository led the Department to evaluate the cumulative impacts for an inventory larger than the Proposed Action in the 2002 Final Environmental Impact Statement (Final EIS)^{vi} prepared at the time of Site Recommendation. The additional waste considered consisted of the remainder of the total projected inventory of commercial SNF, DOE SNF and DOE HLW.

The current repository layout encompasses 1,250 acres at a thermal load of approximately 55 to 60 MTHM/acre. Past studies have shown design layouts that encompass as much as 4,200 acres, which is more than three times the area of the layout currently used to accommodate 70,000 MTHM (Figure 2). Also, recent thermal loading studies^{vii} indicate that the allowable thermal load is greater than the 55 to 60 MTHM/acre value currently used. More importantly, those studies, which are based on extrapolation of data from the area that has been characterized in detail for the 70,000 MTHM inventory in the Yucca Mountain license application to NRC, indicate that significantly greater thermal loads can be accommodated by extending the time that the repository is open and ventilated prior to repository closure.

Taken together, those studies provide confidence that a repository at Yucca Mountain has the capacity to handle all of the DOE SNF and HLW and the projected inventory of commercial SNF assuming operating life extensions for all of the existing commercial nuclear power reactors.

An independent study^{viii} found similar results, concluding that the current statutory limit on Yucca Mountain disposal capacity is a small fraction of the actual available physical disposal capacity at the Yucca Mountain site. That study concluded that at least four times this statutory limit established by Congress could be emplaced at Yucca Mountain, and that, with additional site characterization, potentially as much as nine times the statutory limit could be emplaced.

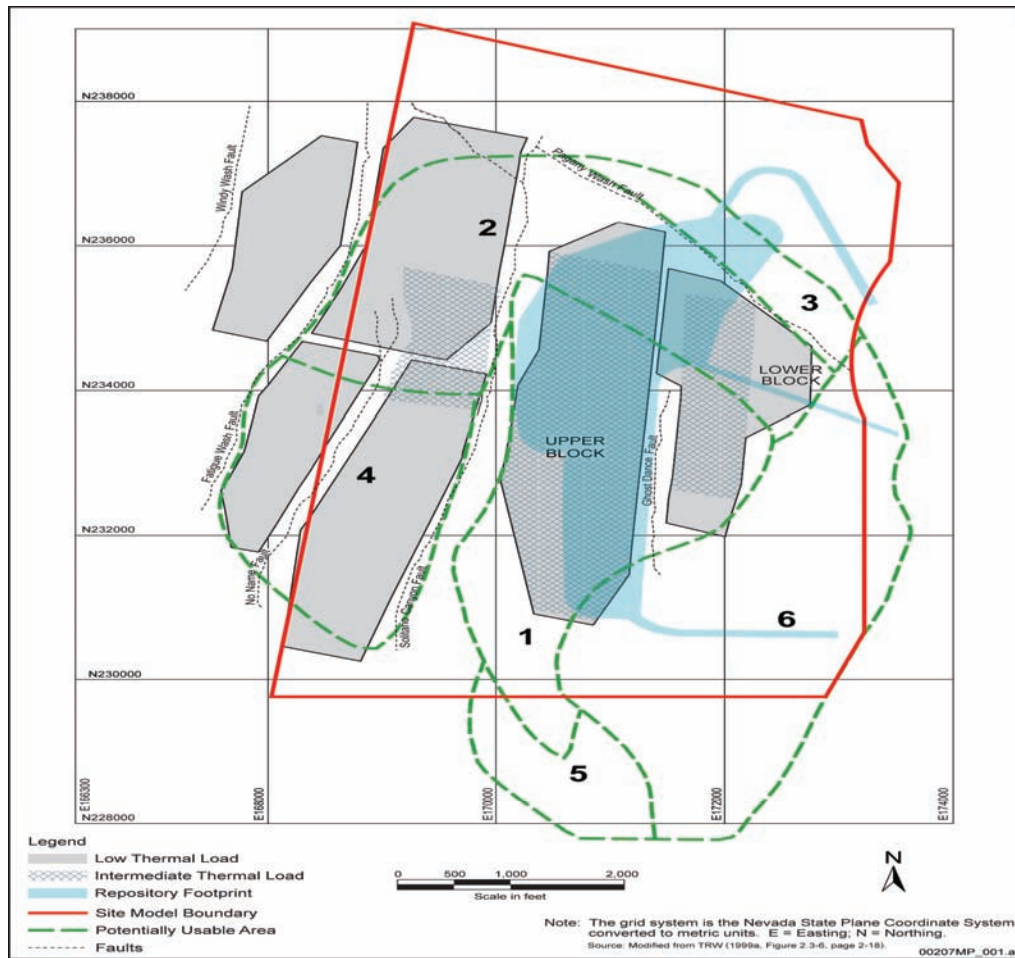


Figure 2. Potential Repository Emplacement Areas (after Mansure and Ortiz) ^{ix}

Total of potential emplacement areas is 9,500 acres. Also shown are current and past repository layouts and areas.

6.2 BEGINNING THE PROCESS OF SITING, DESIGNING, LICENSING, AND CONSTRUCTING A SECOND REPOSITORY AS SOON AS POSSIBLE

If the statutory limit of 70,000 MTHM is not modified, a second repository is needed. Due to specific limitations included in the NWPA,^x new authorizing legislation and specific appropriations would be needed before the Department could conduct any site-specific work on a second repository. In addition, specific authorization would be needed to construct a second repository since the NWPA authorizes only the first repository and limits use of the Nuclear Waste Fund to construction of facilities specifically authorized by law. Finally, the Amendments Act deleted the provisions relating to siting a second repository and amended the key provisions in Section 114 relating to site recommendation, National Environmental Policy Act requirements, and licensing to apply specifically to Yucca Mountain. These changes leave the process for siting and licensing a second repository undefined.

The analysis in this report assumes a second repository would have to begin operation by 2041 in order to permit DOE to continue waste acceptance without disruption. This assumption is based on emplacing the 70,000 MTHM permitted by current law in Yucca Mountain by 2041. The schedule for the second repository assumes that the siting, designing, licensing, and construction process for the second repository would begin in 2011, allowing 28 years for the completion of that process. The 1987 Mission Plan Amendment, issued before the Amendments Act was passed, presented a schedule for siting and developing a second repository following a national site survey. The process was estimated to take about 28 years. That estimate was based on use of the second repository provisions of the NWPA of 1982, which specified the details of the siting and licensing process. That period may be considered optimistic, since the time between the start of the first repository siting process in 1983 and the earliest possible start of operations at Yucca Mountain in 2020 is 37 years.

In addition, the need for legislation before any site-specific work could be performed introduces substantial uncertainty into the schedule for a second repository. Opening the NWPA to reinstate a second repository program could reopen all of the issues about the siting process that took years of congressional effort to resolve prior to passage of the Act in 1982 – the role of host states, the number of sites to be characterized, criteria for guidelines, the site recommendation process, voluntary versus directed siting, and other matters. One approach would be simply to reinstate the deleted second repository provisions and add authorization for construction of a second repository. Even then, however, the elimination of parallel characterization of three sites for the first repository in 1987 suggests that the number of sites to be characterized for a second repository would need to be revisited.

Assuming the process must begin around 2011 to avoid a halt in receipts between the time Yucca Mountain reaches the statutory limit and the second repository is in operation, Congressional action to establish the siting process and provide the needed funding would be needed by 2010.

Siting a Second Repository

If the Congress chooses not to raise or eliminate the statutory cap on the disposal capacity at Yucca Mountain and instead chooses to authorize a second repository program, the most efficient path to identifying potential sites for a second repository would be to start with the other sites and areas that were under consideration for either the first or second repository before the Amendments Act was passed. The nine sites comprising the first Repository Screening Program were:

First Repository Sites	Geologic Media
Vacherie Dome, Louisiana	Dome salt
Cypress Creek Dome, Mississippi	Dome salt
Richton Dome, Mississippi	Dome salt
Yucca Mountain, Nevada	Tuff
Deaf Smith County, Texas	Bedded salt
Swisher County, Texas	Bedded salt
Davis Canyon, Utah	Bedded salt
Lavender Canyon, Utah	Bedded salt
Hanford Site, Washington	Basalt flows

DOE reference documents^{xi} prepared in the same timeframe identify 17 states within which there were granitic bodies believed to be adequate for investigation for siting a repository for the second repository program. The states identified included:

Minnesota	Wisconsin
Michigan	Maine
New Hampshire	Vermont
Massachusetts	Connecticut
Pennsylvania	New York
New Jersey	Delaware
Maryland	Virginia
North Carolina	South Carolina
Georgia	

Supporting references^{xii, xiii} identify eight additional states under consideration by the crystalline rock program as having granitic bodies that could be adequate for investigation for siting a repository for the second repository program:

- Washington
- Idaho
- Arizona
- Wyoming
- Texas
- Alabama
- South Dakota
- Oklahoma

Therefore, from the original first and second repository programs a total of 31 states have been identified that have potential sites or areas that could be evaluated for their potential for a second repository. These states are illustrated on Figure 3.

In the 1987 Mission Plan Amendment released before passage of the Amendments Act, the Department described an alternative program for proceeding with a second repository that started the second repository program over again with a national site screening process that would expand the types of geologic media and number of geographical areas considered. Some work already existed at that time to provide a basis for such an alternative approach. For example, in order to increase the diversity of rock types under consideration by the geologic repository program, the Department had initiated the Sedimentary Rock Program (SERP) in 1984. The objective of this program was to evaluate five types of sedimentary rock (sandstone, shale, chalk, carbonate rocks, and anhydrock) to determine the potential for locating a geologic repository site in one of these rock types. In that evaluation,^{xiv} shales were found to be equal to, or better than, the other four rock types.^{xv} Hard or rocklike shales having the favorable characteristics leading to this conclusion occur extensively in the conterminous United States.

the Department has been found to be liable for certain damages attributable to the delay in SNF acceptance. In a 2002 decision, the 11th U.S. Circuit Court of Appeals held that the Department is not authorized to spend Nuclear Waste Fund monies on settlement agreements compensating the utilities for their onsite storage costs.^{xvi} Rather, damages are paid by federal taxpayers through the U.S. Treasury's Judgment Fund. DOE has estimated that the liability associated with the delay in waste acceptance, based upon the beginning of operations at Yucca Mountain in 2020, and continuing without interruption until all the spent nuclear fuel has been received, may be up to \$11 billion, and could increase significantly for each additional year operations are delayed or interrupted.

Deferring a decision on the second repository until a choice is made whether to pursue one of the reprocessing options currently under consideration does not affect the analysis concerning commercial SNF. As noted previously, application of the current 70,000 MTHM statutory limit is the same whether SNF is emplaced as the original spent fuel rods or the SNF is reprocessed and only the resulting HLW is emplaced. In addition, while reprocessing offers the potential to make the fuel cycle and disposal more efficient, there is no basis to speculate what, if any, volume of SNF generated before the deployment of reprocessing technology will be reprocessed. It is highly uncertain to what extent the economic and technical factors that would support the business case for reprocessing SNF as it is being generated would also support the reprocessing of legacy SNF.

Deferring action also increases uncertainties about final disposition of the DOE HLW and SNF that is not included in the 7,000 MTHM portion of the 70,000 MTHM statutory limit allocated to national defense waste. Lack of any knowledge about the characteristics of the site and repository design that might be used for disposal of this material complicates decisions about final waste solidification and other steps in preparation for disposal. Uncertainty about the timing of availability of the needed additional disposal capacity would also complicate planning for final cleanup and decommissioning of the sites and facilities where the material is now stored. Continued deferral of a decision to add that disposal capacity will add to the costs of management at the current sites, and could threaten the Department's ability to fulfill agreements with the states hosting those sites to remove the waste for permanent disposal.

7. POTENTIAL LEGISLATIVE ACTIONS

Legislative action is required for the first and second alternatives and most likely is required for the third alternative. Using the Yucca Mountain repository for all of the projected SNF and HLW would require elimination of the 70,000 MTHM statutory limit. The Administration already has proposed legislation to accomplish this objective. Deciding to proceed with a second repository also would require legislation to authorize the repository and to specify how the second repository would be sited and licensed. While deferring the decision on the second repository does not require legislation to implement, it most likely would produce results that would require Congressional actions, such as direction on how to deal with the failure to honor contracts concerning commercial SNF and commitments and agreements concerning DOE SNF and HLW.

8. CONCLUSIONS

This report concludes that considerably more than 70,000 MTHM of SNF and HLW will require disposal in a geologic repository. In fact, at this time there is more than 58,000 MTHM of commercial SNF in storage, increasing at a rate of about 2,000 MTHM per year, and approximately 12,800 MTHM of SNF and HLW in storage at government sites. The inventory of waste materials planned for disposal in Yucca Mountain, which includes 7,000 MTHM of DOE SNF and HLW in addition to the commercial SNF, will reach the 70,000 MTHM statutory capacity limit in 2010.

A repository at Yucca Mountain that remains subject to the current NWPA statutory capacity limit of 70,000 MTHM cannot accommodate all of the currently projected commercial and DOE and U.S. Navy SNF and HLW. If the statutory limit on the first repository is not lifted, then a second repository will be needed. However, studies indicate that three times the statutory limit of 70,000 MTHM, or possibly more, could be accommodated by expanding the repository layout at Yucca Mountain. Lifting the statutory limit on the disposal capacity at Yucca Mountain provides an opportunity to defer the need to reassess repository capacity requirements. During this deferral period the future growth of nuclear energy and impacts from nuclear fuel recycling will become more clear, enabling a more informed decision regarding the need for a second repository. Based on the above, the Secretary of Energy recommends that Congress act promptly to remove the statutory limit of 70,000 MTHM for the Yucca Mountain repository and defer a decision regarding the need for a second repository.

Endnotes

- i Public Law 97-425, Jan.7, 1983, Section 161(b) [42 U.S.C.10172(b)]
- ii Public Law 97-425, Jan.7, 1983, Section 114(d) [42 U.S.C. 10134(d)]
- iii Public Law 97-425, Jan.7, 1983, Section 114(d) [42 U.S.C. 10134(d)]
- iv Huizenga, D. 2001. "Integrated Acceptance Schedule for Department of Energy Spent Nuclear Fuel and High-Level Waste." Memorandum from D.G. Huizenga (U.S. DOE Office of Environmental Management [EM]) to L.H. Barrett (OCRWM). July 11, 2001. ACC: MOL.20010821.0087.
- v CRWMS M&O, 1995, Generic Subsurface Layouts for Various Repository Thermal Loadings. BC000000-01717-5705-00002, Rev. 00
- vi DOE 2002. Final Environment Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada. DOE/EIS-0250. Washington, D.C.: U.S. DOE Office of Civilian Radioactive Waste Management (OCRWM). ACC: MOL.20020524.0314 through MOL.20040524.0320
- vii DOE 2008. Postclosure Analysis of the Range of Design Thermal Loadings, concurrence review copy dated January 2008. ANL-NBS-00057 Rev. 00C.
- viii Electric Power Research Institute, 2006, Analysis of the Maximum Disposal Capacity for Commercial Spent Nuclear Fuel in a Yucca Mountain Repository, 1013523, Technical Update.
- ix Mansure, Arthur J., and Terri Smith Ortiz, 1984, Preliminary Evaluation Of The Surface Area Available For A Potential Nuclear Waste Repository At Yucca Mountain, Sandia Report, SAND84-0175.
- x Section 161 of the NWPA provides that the Secretary may not conduct site-specific activities with respect to a second repository unless Congress has specifically authorized and appropriated funds for such activities. 42 U.S.C. 10172a.
- xi DOE 1985. Mission Plan for the Civilian Radioactive Waste Management Program, Vol. I. DOE/RW-0005 Volume 1 of 3 volumes, p. 40 for six states originally considered for first repository siting, p. 42 for the 17 states considered for potential second repository crystalline (granite) sites.
- xii OCRD, 1983 A National Survey Of Crystalline Rocks And Recommendations Of Regions To Be Explored For High-Level Radioactive Waste Repository Sites Office of Crystalline Repository Development, OCRD-1 [Fig 17].
- xiii DOE, 1986. Draft Area Recommendation Report for the Crystalline Repository Project U.S. Department of Energy, Office of Civilian Radioactive Waste Management, Crystalline Repository Project Office, DOE/CH-15(0).
- xiv Croff, A. G., T. F. Lomenick, R. S. Lowrie, and S. H. Stow, 2003, Evaluation of Five Sedimentary Rocks Other than Salt for Geologic Repository Siting Purposes Volume 1: Main Report, Oak Ridge National Laboratory, ORNL/TM-2003/256/V1.
- xv Ibid. The report also includes the results of a survey of foreign activities concerning sedimentary rocks other than salt that disclosed that only shale-like rocks were being seriously considered. Shales and/or clays (along with granite) were the geologic media of choice in Belgium, Italy, and Japan. Shales and clays were considered to be alternatives in France, England, and Canada. Clays were also being considered in virtually every country for use as backfill material.
- xvi Office of Civilian Radioactive Waste Management Fiscal Year 2002 Annual Report to Congress, DOE/RW-0560, page 27.

INTENTIONALLY LEFT BLANK