



Implementation Plan for Deployment of Federal Interim Storage Facilities for Commercial Spent Nuclear Fuel

January 1989

*U.S. Department of Energy
Office of Civilian Radioactive Waste Management*

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INTRODUCTION

The Nuclear Waste Policy Act of 1982, as signed by the President on January 7, 1983, ^(a,b) authorized, among other things, a Federal Interim Storage (FIS) program for spent nuclear fuel from domestic civilian power reactors. In Section 131 of the Act, Congress indicated that the owners and operators of nuclear power plants have the primary responsibility for providing storage for spent fuel by maximizing, to the extent practical, the use of existing at-reactor capacity and that the Federal Government (the Department of Energy) has the responsibility to encourage and expedite the efficient use of, and additions to, such capacity. The Federal Government also has the responsibility to provide storage for spent fuel from civilian nuclear reactors under certain limited circumstances. With respect to this responsibility to provide FIS, the Act specifically provides that:

- o The Secretary of Energy shall provide for not more than 1900 metric tons of uranium (MTU) of storage capacity, when the need is established, through the use of available storage capacity at facilities owned by the government on January 7, 1983, acquisition of spent fuel storage equipment, or construction of storage capacity at reactor sites [Section 135 (a)(1)].
- o Such storage capacity shall not be provided at any Federal or non-Federal site within which there is a candidate site for a repository [Section 135 (a)(2)].
- o FIS services shall be made available only when the U.S. Nuclear Regulatory Commission (NRC) has determined that the owner and generator of spent nuclear fuel cannot reasonably provide the required storage capacity and is diligently pursuing licensed alternatives to FIS [Section 135 (b)].

(a) Public Law 97-425, 96 Stat. 2201, 42 U.S.C. 10101 et seq., referred to herein as the Act.

(b) The Nuclear Waste Policy Act of 1982 was amended by the Nuclear Waste Policy Amendments Act (the Amendments Act) of 1987 and was signed into law by the President on December 22, 1987. The Amendments Act did not change the Federal Interim Storage (FIS) requirements of the original Nuclear Waste Policy Act of 1982.

- o In selecting from the methods for providing storage, consideration shall be given to the timeliness of availability and to minimizing fuel transportation, public health and safety impacts, and costs of such storage [Section 135 (a)(3)].
- o The Secretary shall establish criteria, terms, conditions, and payment fees for FIS services [Section 136 (a)].
- o The Secretary must recover the full costs of the FIS program from users of the storage capacity; each user will pay a pro rata share of the costs [Section 136 (a)(3)].
- o The Secretary shall utilize private industry to the fullest extent possible in each aspect of spent fuel transportation [Section 137 (a)(2)].
- o Any fuel stored in FIS shall be removed no later than 3 years following the availability of a repository or a monitored retrievable storage facility [Section 135 (e)].

The Act further provides that the Secretary shall prepare an annual report to Congress on plans for providing FIS. The report is to include a description of the specific manner of providing FIS capacity that is selected by the Secretary, if any [Section 135 (f)].

This document is the sixth annual report on plans for providing FIS capacity. References are made to the first, second, third, fourth, and fifth annual reports, as necessary. (1,2,3,4,5) Background factors and aspects that were considered in the development of this deployment plan and activities and interactions considered to be required to implement an FIS program are discussed. A generic description of the approach that the Department plans to follow in deploying FIS facilities is also described.

ALTERNATIVES CONSIDERED

As reported in the initial deployment plan, the Department has considered a number of alternative storage methods, potential sites, and transportation arrangements. (1) Currently available active and passive storage methods include storage in water pools, dry storage vaults, and dry storage modules (metal storage casks, dry wells, and modular concrete storage structures); all of these alternative storage methods have been considered. The Department has considered locating FIS facilities at reactor locations and existing Federal sites. The Department has considered both the use of commercial services for transporting spent fuel from reactor locations to FIS sites and the acquisition of a shipping capability by the government should commercial services prove to be inadequate.

Section 135 (a)(1)(B) and (C) of the Act allows the Department to develop FIS capability at reactor locations. However, it has been determined that utilities could develop these capabilities as quickly as the Department. Establishing FIS facilities at reactor locations would require an NRC license for construction and operation of the necessary facilities. Therefore, it is doubtful that any time savings would be achieved by Department involvement. Moreover, participation by the affected State governments and Tribal councils, as required by Section 135 (d) of the Act, might require additional time for deploying the storage facilities. A utility company could be subject to less stringent procedures. The possibility of locating FIS facilities at reactor sites has not been further pursued in the past 5 years.

In considering those Federal sites that might be potentially acceptable, the Department has directed its attention only to sites that would minimize the impacts on public health, public safety, and the environment. Further, to minimize costs and the time to complete, the Department has addressed potential sites with the following characteristics (as reported in the initial, second, third, fourth, and the fifth annual deployment plans): (1,2,3,4,5)

- o existing water basin or dry vault facilities that could be used to store commercial spent fuel and that are located closest to adequate transloading facilities - The use of such existing facilities would be the most desirable alternative because they could be made ready and available to meet early FIS needs (0 to 18 months, depending on required modifications or additions)
- o existing hot cell facilities that could be used to transfer commercial spent fuel from shipping casks into storage modules -- the use of existing hot cell facilities in conjunction with newly acquired storage modules would also

permit relatively early availability (24 to 36 months) and would result in substantial cost savings over storage in new facilities

- o existing support facilities (change rooms, laundry, security, administrative, health physics, etc.) that could be utilized in conjunction with new transfer and storage facilities constructed at that site -- the construction of the new facilities at an existing site with support facilities is the least attractive alternative due to both schedule (48 to 54 months) and cost.

Due to time and financial constraints imposed by the Act, the range of feasible near-term alternatives is considered to be limited to the use of available existing storage and hot cell facilities.

In addition to the storage alternatives described above, the Department has also considered the possibility of storing spent fuel in shipping casks at a Federal site. Although such storage would be very limited and very costly due to the limited number and capacity of existing casks, it could provide an early capability for accommodating FIS requirements while permanent facilities were being prepared.

EXAMINATION OF EXISTING FACILITIES

As reported in the initial deployment plan, the Department has investigated the possible use of existing Federal facilities to store spent nuclear fuel.⁽¹⁾ Based on these investigations and on the criteria described earlier and recognizing that the use of candidate repository sites is prohibited by the Act, the Department has concluded that there are existing Federal facilities capable of providing the basic anticipated FIS needs. However, neither the specific feasibility nor the economics of the use of such facilities for FIS has been established. To date, no attempt has been made to establish if any of these facilities constitute a "potentially acceptable site" under Section 135 (d) of the Act.

While there are no available potential Federal sites in the eastern United States with existing and adequate transfer and storage facilities, the Department has considered Federal sites to which such facilities could be added. Because many potential sources of spent fuel that might qualify for FIS are in the eastern part of the country, this approach would minimize transportation requirements and costs. While several sites were tentatively identified, no further evaluation has been conducted or is planned because of the high cost of new facilities and the long lead time noted earlier.

EXISTING COMMERCIAL SHIPPING CAPABILITY

The Department has investigated the capabilities of commercial firms offering spent fuel shipping services and their potential ability to meet future needs. (1,2,3,4,5) At the time of the initial investigation, it was concluded that sufficient commercial capability was available (1) for transporting spent fuel from reactors to FIS facilities. However, the concern was expressed that if any of this capability (for example, shipping casks) were committed to and used for storage or other exclusive uses, the remainder might not be sufficient to meet shipping requirements.

A more comprehensive study was then conducted to determine if the existing commercial spent fuel shipping cask fleet is adequate (6) to provide the needed transportation services through 1992. Although over 4 years have now elapsed since the issue of Reference 6 in November of 1984, the study remains valid with respect to shipping capability, because the utility industry has successfully managed their storage needs to values well below the yearly projected spent fuel storage needs (References 1 through 21). For example, in 1985 (14) the projected cumulative storage requirements were 126 metric tons for 1987 and 271 metric tons for 1988. The projections (17) for the years 1987 and 1988, as shown in Table 1 of this report, are 80 and 137 metric tons. Thus, the Department continues to conclude: 1) due to shipping cask handling limitations at a number of reactor sites, about 70 percent of the spent fuel with the potential for FIS would have to be shipped by truck, and 2) if utilities require FIS services similar to those indicated by the maximum at-reactor capacity case in Table 1, the legal-weight truck casks currently in service will not be adequate for the shipments needed as early as 1990.

As noted in the Mission Plan for the Civilian Radioactive Waste Management Program, (7) the Department will continually assess the effects of transportation activities and plans to assure spent fuel will be transported in accordance with all applicable Department of Transportation (DOT) and NRC regulations.

POTENTIAL NEED FOR FEDERAL INTERIM STORAGE OF SPENT FUEL

The Department has studied the potential needs for additional spent fuel storage by utility companies and has published a report each of the last several years analyzing in detail the current spent fuel storage situation in the United States. (8-17) The Department has just updated the assessment for the need for spent fuel storage. (17) Current estimates (as of October 1988) of the requirements for additional storage capacity in future years are shown in Table 1.

TABLE 1. Projected Spent Fuel Storage Needs Based on the No-New-Orders Case, Reference 17. (a)

Year	Maximum At-Reactor Capacity, (b) MTU		Maximum At-Reactor Capacity Plus Transshipment, (c) MTU	
	Annual	Cumulative	Annual	Cumulative
1987	80	80		
1988	57	137	7	7
1989	92	229	63	70
1990	90	319	27	97
1991	136	455	35	132
1992	158	613	91	223
1993	218	831	104	327
1994	187	1018	83	410
1995	267	1285	195	605
1996	276	1561	109	714
1997	411	1972	247	961
1998	556	2528	306	1267
1999	566	3094	339	1606
2000	570	3664	443	2049

- (a) Projections are lower than reported in last year's report, primarily because DOE's No New Order Case is this year's basis, while previous projections were based on RW-859 data.
- (b) Represents the storage needs assuming that utilities will use spent fuel pool reracking and/or specific offsite transshipments which are currently licensed by NRC.
- (c) Assumes that, in addition to (b) above, possibilities for other transshipment of fuel within any given utility system will be maximized.

These estimates are based on the information presented in Reference 17. The estimates in Table 1 do not include consideration of any prospective reduction in storage needs (not fully quantifiable at that time) that may result from:

- o plant capacity factors lower than currently planned by the operating utilities
- o continued decisions by utilities to extend fuel exposure cycles and/or to reinsert previously discharged fuel assemblies in reactors for additional burnup
- o future increases in the storage capacities at reactor sites through expansion of existing storage pools beyond what the utilities now believe is feasible, through addition of water storage facilities, or through application of recently licensed dry storage techniques resulting from ongoing Department research, development, and demonstration programs authorized by Section 218 of the Act.

Extending the fuel exposure cycles to achieve additional burnup could reduce the near-term storage requirements by a considerable margin. Increased storage capacities at reactor sites, through the use of recently licensed dry storage technologies, could also result in further reductions in, or even elimination of, the requirements for FIS.

Owners and operators of reactors where storage problems do not occur in the near future should have a reasonable amount of time to provide the needed additional storage capacity at the reactor site. Therefore, the Department believes that the need for FIS services will only arise from near-term storage needs plus those that develop subsequently at reactor sites due to licensing, construction, and other delays in developing private storage that are beyond the reasonable control of the utility.

FIS DEPLOYMENT PLAN

The objective of the FIS program is to plan for and provide assurance of a Federal capability to store (on an interim basis) limited quantities of spent fuel from utilities operating nuclear power plants in the United States. This storage capability will be made available when a dire need exists (i.e., when, despite their best efforts, utilities are unable to meet their spent fuel storage needs) as determined by the NRC. The criteria governing this activity will be in accordance with the provisions of the Act.

If FIS is established, it will be handled on a stand-alone full-cost recovery basis utilizing a single-purpose Interim Storage Fund. The Department has developed a strategy and initiated efforts to assure deployment capability when and if it is necessary without risking large expenditures. Alternative storage methods, probable sites, and transportation arrangements have been considered by the Department in formulating plans for FIS deployment.

Considerable uncertainties exist as to the source and quantity of spent fuel that may qualify for FIS as well as the time schedule that such services may require. Thus, dry modular storage methods are currently considered to be the most flexible in meeting the storage requirements with minimum financial expenditures and with high utilization efficiency of the installed storage capacity--except where existing water basin or dry vault storage facilities would be available. Only sites that would minimize the impacts on public health, public safety, and the environment will be considered as potential FIS sites. Compliance with appropriate laws and regulations (such as the National Environmental Policy Act and Related Federal Environmental Statutes) will be integrated early in the planning process for selection of a FIS site.

The Department considers that it is premature to identify specific sites at this time due to the following uncertainties and limitations:

- o the source, quantities, and schedule of availability of spent nuclear fuel that may be determined to be eligible for FIS by the NRC
- o the alternative storage methods available
- o the inability to commit funds prior to entering into a specific contract for fuel storage due to the requirement that the Department must recover all costs associated with FIS activities

- o the availability of Federal facilities for use in the FIS program at the time the need exists.

The Department has developed a general plan for the deployment of any required FIS capability and is planning to use the following general approach for the timely deployment of the required FIS capability. The overall intricacies and interactions of this plan are depicted in Figure 1.

The NRC has not received any applications for a determination of eligibility for FIS services. When the NRC receives the first application from a potential user, which in the opinion of the Department has a reasonable chance for NRC approval, and the possible magnitude and timing of storage requirements are known, the Department plans to follow the steps outlined below to expedite the implementation of FIS:

- o Review the current information on possible sites, considering their availability and the quantities and delivery dates for the spent fuel to be stored; and determine which sites should be considered as potentially acceptable FIS sites.
- o Notify, in writing, the governor, State legislature of those States, and the Tribal council (GSLTC) of any affected Indian Tribe of such findings, as required by Section 135 (d)(1) of the Act
- o Initiate site-related environmental, economic, technical, institutional, and sociological studies for the identified sites; inform the GSLTC of the progress of these studies.
- o Prepare a request, to be submitted to Congress, for a supplemental appropriation in order to make initial expenditures from the Interim Storage Fund per Section 136 (f)(2) of the Act.

The Department would terminate the above activities if: 1) the NRC rejects the application for determination of eligibility; 2) the utility does not initiate contract discussions in a timely manner; or 3) the Department does not have sufficient programmatic funds available to perform the work.

When a contract for FIS services is executed, the Department will:

- o Submit a request to Congress for a supplemental appropriation to commence expenditures from the Interim Storage Fund.

- o Select the specific site and the storage mode or combinations thereof based on considerations of the quantities and sources of spent fuel to be stored, the availability of candidate sites, the acceptability of available sites for FIS activities, and the availability of existing facilities that could be used for FIS activities at such sites. Major considerations in selecting an FIS site will be public health and safety, protection of the environment, and adequate control of costs and schedule.
- o Immediately notify the affected GSLTC upon selection of a specific site and prior to undertaking any site-specific construction activities [Section 135 (d)(2)]. Promptly thereafter, the Department will enter into negotiations with the affected GSLTC to 1) establish a cooperative agreement giving them the right to contribute at all project stages from planning through closure; 2) provide for public participation in those negotiations; 3) develop minimum guidelines for such public participation; and 4) determine if there is a need for impact assistance [Section 136 (e)].
- o Advise the appropriate Congressional committees of the site selection if a research, development, or demonstration facility is chosen, as required under Section 218 (e)(1) of the Act.
- o Collect the initial fee payment from the user(s) of FIS services as developed in the latest analysis and stipulated in the Federal Register for the current year. (21)
- o Complete the environmental assessment and other site-related studies initiated earlier or as needed to meet the requirements of Section 135(c) and then initiate design activities for FIS facilities for the spent fuel that is under contract.
- o Initiate construction of the required FIS facilities at the selected site; the prepared facility will have capacity to store only the spent fuel that is under contract to the Department.
- o Prepare to store less than 300 MTU at the first site (current forecasts of prospective spent fuel storage needs under the provisions of the Act indicate that it is unlikely that more than 300 MTU of spent fuel will qualify for FIS). In the event that subsequent developments result in 300 MTU or more of spent fuel qualifying for FIS, the Department will, on a timely basis, take such actions as necessary per the Act to store the additional spent fuel at the first site or to select a second site.

- o Contract for commercial services for transporting the spent fuel from the reactor to the FIS facilities to the extent that such services are available on a timely basis and at a reasonable cost.
- o Take title to the spent nuclear fuel under contract at the reactor site. Ship, receive, and store the fuel at the FIS site.
- o Collect from the users of the FIS services their pro rata share of the costs to implement, operate, and decommission the FIS facility as stipulated in the Federal Register for the current year. (21)

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