UNITED STATES OF AMERICA
BEFORE THE NUCLEAR REGULATORY
COMMISSION

In the matter of	)	
	)	
PROPOSED RULEMAKING ON	)	Docket No. PR-50, 51
THE STORAGE AND DISPOSAL	)	
OF NUCLEAR WASTE	)	

TENNESSEE VALLEY AUTHORITY'S STATEMENT OF POSITION

INTRODUCTION AND SUMMARY

The Tennessee Valley Authority (TVA) hereby submits its statement of position in the above-captioned proceeding. As stated in the Notice of Hearing, this proceeding is designed to: (1) reassess confidence that safe storage of spent fuel will be possible; (2) determine when storage or offsite disposal will be available; and (3) examine whether wastes can be safely stored onsite, if offsite storage or disposal will not be available until after the expiration of the licenses for nuclear facilities. It is TVA's position that safe storage of spent fuel resulting from the operation of TVA's reactors in operation or under construction is possible now and that spent fuel can be safely stored onsite in the event that offsite storage is not available. This is based on the following:

8007100050

- spent fuel produced by reactor operations can be stored indefinitely in the present generation of onsite fuel pools safely and without endangering the environment;

- suitable technologies are available for significantly increasing the capacity of existing onsite fuel pools without sacrificing safety or environmental protection;

- emerging technologies will enhance further the present capability to store safely spent fuel.

TVA's position is based, in part, on TVA's successful spent fuel management experience detailed herein. Also included is an overview of our safety-oriented spent fuel management policies and a discussion of the options, both available and emerging, for coping with spent fuel storage needs well beyond the operating lives of plants now licensed or planned.

BACKGROUND

TVA operates the 3-unit Browns Ferry Nuclear Plant and has received a low power operating license for unit 1 of its nearly complete 2-unit Sequoyah Nuclear Plant. Additionally, TVA has construction permits for 13 other reactor units, the nation's largest nuclear power program. This program requires the planning and implementation of a comprehensive waste management program. To do this, TVA has assembled a staff with expertise in all aspects of waste management, including the handling of spent reactor fuel. The TVA system has, to date, successfully handled an ever-growing inventory of spent fuel (infra). Because our future spent fuel management needs are so great, we have examined in detail the foreseeable options.

DISCUSSION

A. Nature of the Problem

Depending on the type of reactor, about one-fourth to one-third of the fuel assemblies must be replaced each year. As a general rule, a reactor unit nominally rated at 1,000 MWe creates approximately 30 metric tons of spent fuel per year. The spent fuel must, of course, be removed from the reactor and stored, pending ultimate disposal.[1] Until 1977, under then existing national policy,

---

1 See generally, United States Department of Energy, Preliminary Environmental Input Statement: Storage of Spent Power Reactor Fuel, DOE/EIS-OOIS-01 (August 1978).

the industry plans contemplated that only relatively small amounts of spent fuel would be kept onsite, and then only for short intervals after discharge and before shipment for reprocessing or ultimate disposal. Accordingly, onsite spent fuel management facilities, especially fuel pools, were designed to receive and hold only a relatively small portion of the fuel discharges likely to be created during the operating lifetime of the plant.

In 1977, reprocessing of spent fuel was indefinitely postponed for reasons of national policy. Accordingly, under present conditions many nuclear plants will exhaust the originally designed onsite spent fuel storage capacity before the expiration of their operating licenses. Even before the promulgation of the policy deferring reprocessing, however, TVA had begun to design and implement a comprehensive spent fuel management program aimed at increasing the efficiency of its spent fuel storage facilities.

B. Description of TVA's Spent Fuel Management Strategy

TVA's spent fuel management strategy is designed to provide adequate capacity for the safe onsite storage of spent fuel at each plant for an indefinite period of time. Implementation of the strategy is accomplished within the constraints of existing spent fuel storage pool design, and through reliance on proven, available technology, at the same time minimizing safety and environmental hazards. The management strategy relies on the proven technology of spent fuel storage pools and fuel handling equipment and techniques.

TVA's operational experience to date demonstrates that spent fuel storage techniques can provide for the safe onsite retention of spent fuel for an indefinite time. At our Browns Ferry Nuclear Plant, several thousand spent fuel assembly movements have been made without difficulty. During fuel storage movements, only six assemblies have been damaged. Those six were only damaged slightly, without the disruption of routine spent fuel storage operations and with no release of radioactivity.

A successful spent fuel management program must minimize radiological exposure, both for workers onsite and the public offsite. TVA's operating results have vindicated emphasis on safety. In the case of occupational exposure, the major risks to workers arise from storage cask loading and preparation for shipment, as well as from cask receiving. Levels of exposure during storage operations are a function of: (1) the intensity of radiation fields near the spent fuel storage pools, and (2) the time spent in the radiation fields. Radiation intensity, in turn, is a function of cask and pool design. To a large extent, exposure is controlled by the use of procedures designed to minimize proximity time for personnel in high-radiation areas.

To date, TVA's spent fuel management operations at Browns Ferry have resulted in onsite occupational exposures well within allowable exposure standard of 4 man-rem/yr., which is lower than the NRC's standard of 5 man-rem/yr. Using actual exposure data at Brown's Ferry, we have estimated occupational doses from handling spent fuel, both until the year 2000 and for the life of the plant. We have projected dose levels for TVA's other plants which will be operational in the future. These estimates are shown in Table 1. That table shows the minimal occupational radiation doses resulting from spent fuel management techniques. Public exposure from the operation of onsite spent fuel storage facilities, by any measure, is negligible. By basing the spent fuel management program on an onsite containment concept, without having to transship spent fuel from plantsite to plantsite to take advantage of available spent fuel storage space, possible exposure to the public is greatly reduced. There have been no problems with ruptures or leaks from the systems, or other abnormal occurrences that could cause safety or environmental problems. TVA's operational experience thus serves to provide confidence that spent fuel can be stored in the present generation of onsite fuel storage pools. There appears to be no reason why storage of spent fuel under water cannot be accomplished, using existing technology, for the life of the plant or longer.

C. Use of Available Technologies Can Increase the Capacity Of Existing Spent Fuel Storage Facilities Without Sacrificing Safety or Environmental Protection

TVA has examined ways to increase the capacity of existing available storage facilities, i.e., onsite spent fuel storage pools. Based on a careful evaluation of the available technology, TVA believes that onsite spent fuel storage capacity can be increased as required, without creating additional safety or environmental problems.

TABLE 1

TOTAL OCCUPATIONAL DOSES FROM HANDLING

SPENT FUEL AT A STORAGE FACILITY

(man-rem)

Onsite Facilities	Year 2000	Life of Plants
Sequoyah	100	170
Watts Bar	90	170
Browns Ferry	40	70
Bellefonte	50	140
Hartsville	0	360
Phipps Bend	0	180
Yellow Creek	0	140
	280	1,230

1 Calculated by multiplying exposure per operation by number of operators involved times the number of trips.

In 1975, TVA recognized that additional spent fuel storage capacity might be needed sooner than forecast at the time its plants were designed. Table 2 illustrates the magnitude of the problem at TVA's first three nuclear plants. TVA considered carefully the options for providing additional onsite spent fuel storage based on the same factors emphasized in the overall spent fuel management strategy: the use of the best available technology to provide for the safe onsite storage of spent fuel for an indefinite time.

Consideration of the options was conducted using existing spent fuel storage pool design. The limitations imposed by pool design (e.g., seismic constraints, heat rejection parameters) in addition to the emphasis on safety factors nonetheless does not rule out consideration of a full range of alternatives, including reracking storage pools with high-density, neutron-absorbing racks, providing for double-tiered fuel racks, and consolidating fuel pins.

Based on a thorough analysis of the advantages and disadvantages of the different technologies, TVA concluded that available means could be used to increase onsite spent fuel storage capabilities, without diminishing safety or environmental standards. The most feasible method is to replace existing inpool storage racks ("reracking") with close-array racks capable of increased neutron capture. Reracking can be accomplished at a typical installation in about 14 months after NRC approval. Another promising technique involves the placement of

TABLE 2

TVA SPENT FUEL REQUIREMENTS[1]

FEBRUARY 1980

	Original Pool Capacity		Year 2000 Need		Life of Plant Need	
Plant	Fuel Assemblies (FAS)	Fill Date	FAS	Shortfall[2]	FAS	Shortfall[2]
BF 1&2	2,150	1981	8,500	2,350	13,550	6,660
BF 3	1,075	1979	3,975	1,125	6,775	3,300
SQ 1&2	800	1987	2,125	925	4,300	2,925
WB 1&2	325	1984	1,975	850	4,325	3,000

1 FAS are rounded off to nearest 25.

2 Shortfalls reflect reracking planned or accomplished.

a second layer of racks over existing ones (double tiering).[2] This technique can be used subsequent to reracking to further extend pool capacity so long as design pool heat rejection capacity and seismic loading constraints do not preclude such modification. Finally, we believe that fuel rod consolidation, while not yet developed sufficiently to allow for commercial use, will soon be practical. These three methods allow for additional spent fuel storage beyond original capacity within the capabilities of fuel pool design.

TVA determined that the advantages to be gained from implementing a reracking strategy at our nuclear plants would be signific nt. Reracking the storage pool capability at the Watts Bar plant, for instance, will increase by a factor of four the amount of fuel that can be stored, without sacrificing already high levels of protection for workers or the public.

D. Advanced Technologies Will Further Enhance the Capability To Store Spent Fuel

In addition to the promising conclusions reached by TVA in its consideration of the available options to increase the capacity of existing onsite spent fuel storage facilities, we are confident

---

2 See, e.g., Parkyn, "LaCrosse BWR Spent Fuel, Storage Modification and Refueling Experience," Transactions of the American Nuclear Society (June 1979).

emerging technologies further will enhance the capability for the safe storage of spent fuel and thus make unlikely the necessity of shutting down plants when existing storage facilities are filled to design capacities.

TVA has studied several future and existing spent fuel storage concepts, including individual and central onsite, central offsite, and combinations of regional onsite and offsite facilities. The study considered safety constraints and produced comparisons of the foreseeable options. While the results of the study, which was conducted with the assistance of outside engineering firms and was subject to independent review, identified some options as being infeasible, our study concluded that both existing and emerging technologies hold promise for further increasing the confidence that spent fuel management creates no insurmountable safety or environmental problems. TVA's study contains detailed justification for the development of independent spent fuel storage facilities which shows that such facilities can be developed to store safely large amounts of spent fuel, in a very cost effective fashion. A copy of the summary report of the study is submitted as appendix A to this statement.

Other emerging technologies merit further development on an accelerated basis. For example, the dry storage concept, whether employed onsite or offsite, especially is promising because in the passive mode dry storage minimizes the use of complex mechanical support facilities. Thus, for example, dry storage obviates the need for concern about potential loss of coolant accidents. Dry storage facilities also promise to be more economical. Spent reactor fuel has been successfully stored in dry storage facilities designed to handle commercial reactor fuel.[3] The Department of Energy has developed a dry fuel storage experimental program involving both aboveground and buried facilities.[4] Perhaps with the emphasis currently placed on the development of dry storage facilities, commercial applications of the concept may soon be possible.

In summary, TVA's in-depth consideration of existing and emerging options for the long-term storage of spent fuel indicates that further study and accelerated development of methods designed both to increase the capacity of present onsite spent fuel storage facilities and to create offsite storage methodologies will go far towards assuring a spent fuel storage capability sufficent to meet the lifetime needs of existing and planned nuclear plants.

---

3 Maxwell and Deacon, "Dry Storage of Inadiated Magnox Fuel in the Air," Nuclear Engineering International (May 1979).

4 See generally, Painter and Mayer, "Design and Operation of a Dry Spent Fuel Storage Installation," Transactions of the American Nuclear Society (June 1979), and Westinghouse Advanced Energy Systems. "Spent Fuel Handling and Packaging Program at the E-MAD Facility, Jackass Flats, Nevada" (1979).

CONCLUSION

The spent fuel management problem can be handled with confidence. There is a 20-year history of good experience with spent fuel handling and storage in water pools. In addition to existing concepts, there are several emerging options which may be used to provide additional storage in existing spent fuel pools. Storage of spent fuel indefinitely will result in little impact on the environment and little health risk to operators or the public.

Respectfully submitted,

TENNESSEE VALLEY AUTHORITY

Herbert S. Sanger, Jr.
General Counsel
Tennessee Valley Authority
Knoxville, Tennessee 37902

James F. Burger

Donald R. Bustion, II

July 7, 1980

Attorneys for Tennessee
Valley Authority