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TIMELY TOPICS ON SPENT FUEL STORAGE

INTRODUCTION

I'm very pleased to discuss with you a matter of crucial importance to our nation -- the storage of spent nuclear fuel from our commercial power reactors. I'm talking not only about spent fuel storage at operating reactors, but also at plants in permanent or extended shutdown. In addressing this issue, I'm hoping to correct numerous current misimpressions some may have about the NRC's views on the relative safety of pool and dry long-term storage for older fuel. Both pool storage and dry storage are safe technologies. But there are significant differences; pool storage requires a greater and more consistent operational vigilance and the satisfactory performance of a larger number of active systems, while dry storage is almost passive.

The history of spent fuel management in this country has taken several turns, with a final resolution still out of reach. Several repository programs have started, stalled, and stopped. The latest effort at Yucca Mountain is progressing but, at best is years from the early phases of licensing, much less the actual underground disposal of spent fuel. A monitored retrievable storage (MRS) facility was expected to start accepting commercial spent fuel beginning in 1998, but no such facility is clearly on the horizon. All of these recent developments have changed the circumstances that we face in spent fuel management.

The obvious conclusion is that an increasing number of plants, both operating and permanently shut-down reactors, will have to provide for additional spent fuel storage on-site for a longer period than originally planned, and even after plant decommissionings, prudence requires that provision be made for continual, stand-alone on-site storage. After pool capacity is

reached, most utilities opt for some sort of dry storage. But the dry storage option has triggered an unprecedented amount of local opposition at many sites, further taxing NRC and industry resources.

For those plants in premature or extended shutdown, the NRC finds several strong reasons why the interim, on-site storage of spent fuel should often be shifted from the existing fuel pool to a dry storage system. These reasons include the continuing operational support activities needed to keep a fuel pool operating properly. Water chemistry and cleanliness, surveillance of rack and fuel condition, and maintenance and surveillance of support systems are all activities that are second nature to an operating plant, but may not always receive adequate attention in a plant that is permanently shut down. Let me stress our continued confidence in the safety of wet pool storage, <u>if done properly</u>, remains undiminished, but dry cask storage offers fewer opportunities for things to go wrong. Therefore, the NRC increasingly views dry storage as the preferred method of interim storage of mature spent fuel for plants in permanent shutdown, as well as for supplementary storage in many operating plants.

In other words:

1. The results of calculations and laboratory testing, coupled with our growing operational and regulatory experience, show conclusively that dry cask storage techniques are safe for the interim storage of spent nuclear fuel for time periods of many decades.

2. Compared with pool storage, the dry cask storage systems are far simpler, use fewer support systems, and offer fewer operational and design challenges, and therefore are less likely to lead to human or mechanical error. These simpler designs also foster improved operational and regulatory efficiencies. We continue to conclude that pool storage remains an abundantly safe storage method, provided that circulation, corrosion-control, and supporting pumps, piping, and instrumentation are properly maintained.

3. Based on our safety reviews and actual experience to date, we conclude that dry cask storage is preferred in many instances, especially for operating plants with limited pool storage capacity and for shut-down plants.

I would now like to discuss our regulatory policies and practices concerning the interim storage of spent fuel and the increasing use of dry cask systems.

<u>THE NEED FOR STORAGE CAPACITY</u>

At a number of sites in the United States, existing reactor pool storage capacity has been reached or will soon be reached. An operational high-level waste repository remains years away in a program that has suffered substantial delays in the past. The future of the MRS is uncertain. Most plants have expanded their pool storage by re-racking to the extent possible. Clearly, the use of a dry cask storage system at reactor sites is increasingly becoming the only available option for continued operation of many of our nation's nuclear plants.

There are other reasons that this alternative storage technology is attractive. Most obviously, for operating plants, there must be additional room in their pools to support upcoming refueling outages; and transferring some of the older fuel to dry storage is the best way to maintain their full core reserve (that is, their ability to unload the full core). In some cases, dry storage may be preferable to re-racking a pool that is approaching thermal, structural, or criticality safety limits.

Licensees with permanently shut-down plants have a strong desire to be able to empty and decommission their reactor spent fuel pools. But a number of pool support systems, including cooling water, electric power, instrumentation, and radiation detection, must remain operable so long as fuel remains in the pool. Neither the pool nor the support systems can be decommissioned; but rather, must be maintained, operated, and tested as if the plant were operating. For some of the older plants, the spent fuel pools are not lined with stainless steel; the cooling and clean-up systems have increasingly demanding maintenance problems; leakage paths may exist from the pool piping systems in some of the older designs; and the support systems are vulnerable to loss of off-site power or other challenges. In such instances, there is an even more compelling case for moving the fuel to a new, modern, dry storage system.

DRY STORAGE TRENDS

Dry storage designs have developed significantly in the decade since Congress enacted programs for dry storage in the Nuclear Waste Policy Act of 1982. Both in this country and overseas, steel casks, concrete casks, and concrete vaults are available in a variety of sizes and shapes. Vendors and utilities continue to talk to the NRC staff about newer dry cask systems, options for storing the unique fuel from certain plants, and amendments to existing approved designs. In the very near future we expect to certify the nation's first dual-purpose cask that is designed for both storage and transportation, a design developed by the Nuclear Assurance Corporation (NAC). The first anticipated use of this dual-purpose NAC cask will be in Spain, under the auspices of Empresa Nacional de Residuos Radioactivos S.A. (ENRESA), the Spanish national waste management company. In addition, we are actively reviewing a second dual-purpose design developed by VECTRA Technologies, Inc., for use at the Rancho

Seco Nuclear Station. This dual-purpose design is a variant of the NUHOMS system, which has been licensed for use at H.B. Robinson, Oconee, and Calvert Cliffs. In addition, we expect to receive a major application from the U.S. Department of Energy (DOE) for several different canister designs for the so-called multi-purpose canister (MPC).

DOE foresees obtaining the initial MPC certification for storage and transportation under Parts 71 and 72, respectively; later they would apply for an MPC license as the innermost canister of a disposal package for the high-level waste repository.

We have experienced a strong and steadily increasing trend in licensing dry storage systems at a variety of sites. We have continued to issue site-specific licenses, most recently for the Prairie Island Station in Minnesota. We also have a process to approve cask designs by generic rule, and we have so crafted that process that from a technical and engineering standpoint, a generically approved cask and a site-specific cask are equally acceptable. We are currently in a rulemaking proceeding to certify the seventh cask design approved for use by reactor licensees under an NRC general license. The first utility to store spent fuel under the general license was Consumers Power Company at the Palisades Station. Five other stations are actively pursuing the general license storage option -- Arkansas Nuclear One, Point Beach, Davis-Besse, Oyster Creek, and Fitzpatrick. Other plants have talked to us informally, indicating their inclination toward dry storage of their spent fuel.

SAFETY IMPLICATIONS

Let me now describe several features of dry storage systems that make their use attractive as an interim fuel storage option. First of all, the systems are all very large and inherently passive. There are no cooling fans or pumps requiring redundancy, piping, ducting, instrumentation and controls, and maintenance. All designs cool to the ambient air by natural convection and conduction. The size of these cask systems makes them highly stable on the storage pad. The spent fuel is stored in a sealed, inert environment, surrounded by a helium gas after air and moisture have been evacuated. This helium environment is passive from a chemical corrosion standpoint, and quite effective from a heat removal standpoint. The large shielding designs have proven to be well within our dose rate acceptance criteria, and measured dose rates have turned out to be a factor of two or three less than that predicted by calculation. Heat-removal performance has been similarly effective. Casks cooled by natural convection often have outlet temperatures significantly and consistently below the allowable design values. Fuel assemblies are collected and stored in a basket, which maintains structural integrity and a safe criticality geometry. The dual-

purpose and MPC concepts will further reduce fuel handling, packaging, and occupational exposure. The passive design features allow a reduced amount of operator surveillance and oversight -- human intervention is typically restricted to occasional temperature measurements, security checks, radiation surveys, and visual inspections. Although we have licensed these designs for a 20-year period, we believe that the present designs may eventually be shown to perform satisfactorily for at least 100 years, a much longer time than is likely to be necessary for interim storage before ultimate spent fuel disposal. I would like to emphasize, we are talking here only about interim storage and the program to develop a permanent repository must continue to go forward.

Nevertheless there will continue to be an essential role for pool storage. Dry storage could not replace pool storage entirely even if we wanted it to, principally because the freshly discharged fuel is much more radioactive and, more importantly, much hotter. Freshly discharged fuel must be cooled in a pool at least for at least five years. However, fuel that has cooled sufficiently can be stored safely and effectively in dry storage containers. Furthermore, pool systems and dry cask storage systems can both be designed, constructed, maintained, and operated safely. Some utilities have installed sufficient pool capacity to handle all interim storage needs for the lifetime of the plant. Thus, the industry can and will continue to have major reliance on pool storage. Licensees that perform within the respective safety envelopes remain free to choose either wet or dry storage; the NRC does not specify choices among risk-acceptable alternatives.

SAFEGUARDS IMPLICATIONS

From a domestic safeguards aspect, the large passive spent fuel casks offers substantial resistance to penetration by an adversary. On-going studies continue to validate that the vulnerability to radiological sabotage or theft of special nuclear material is low. The inherent physical protection provided, in part, by storage casks minimizes the need for additional extensive security. As a result, Commission policy on the protection of spent fuel takes advantage of cask design features in defining adequate protection of spent fuel.

With respect to specific physical protection measures required, we make no special distinction between measures needed for dry cask versus pool storage. This approach assumes that basic capabilities for a trained and equipped security organization, procedural and physical access controls, communications, detection, assessment, and response are in place.

From an international safeguards perspective, the operator of a spent fuel storage facility, whether pool or dry cask, is required to provide a listing of the identity, location, and

content of each spent fuel assembly. The International Atomic Energy Agency (IAEA) must be given the opportunity to maintain containment and surveillance to assure no removal of spent fuel. For a spent fuel pool, these measures are fundamentally straightforward, but do have some complications. In particular, in case of malfunctioning of the surveillance camera, the IAEA has to count the spent fuel assemblies and check the attributes of spent fuel assemblies on a random basis. For dry cask storage, the IAEA provides for surveillance of the storage area, observes the loading of the spent fuel into the cask, and then verifies the seal of the cask thereafter. However, malfunctioning of the surveillance camera will not result in IAEA's re-counting spent fuel assemblies as long as the integrity of the seal of the cask is maintained. This simplifies the IAEA task, as well as easing the burden on the operator.

CONCLUSION

Spent fuel storage, whether wet or dry, is a regulatory issue that the NRC takes very seriously. When new storage space is needed at a particular operating power plant, for the reasons I have discussed this morning, dry storage is almost certainly preferred as a supplement to wet storage for the older fuel at the site. Dry storage may often be even more desirable at the permanently shut-down plants, where it is a candidate to replace, and not just to supplement, pool storage. The technology and process for regulatory review and oversight of spent fuel storage have been fully developed. I'm confident that the program for the nation's spent fuel storage is well under control. The storage systems are performing their required safety functions and are protecting the environment.

On a more strategic level, the high level of safety performance of these spent fuel storage systems is not universally recognized. In many areas, public perception of spent fuel storage, and even some professional perception, is unbalanced. One of the more striking examples involved the Prairie Island site, where it was argued that, although it is safe to run a two-unit reactor on the island, it is not safe to store aged spent fuel in dry casks on the same island. This issue requires a better understanding of the very low risk associated with dry spent fuel storage and public confidence that such storage is an interim solution. Better progress in providing long-term disposition of spent fuel is required before the public will understand and generally accept interim on-site storage of spent fuel. The Department of Energy is giving priority attention to the matter of long-term storage and disposition of spent fuel. I am confident that they will continue to pursue this issue diligently and I am hopeful that timely resolution of this issue can be achieved.