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MAR 22 1991

MEMORANDUM FOR: Frank Ingram
Assistant to the Director
Office of Governmental and
Public Affairs

FROM: Robert M. Bernero, Director
Office of Nuclear Material Safety
and Safeguards

SUBJECT: UPDATED FACT SHEET ON RADIOACTIVE WASTE
(NMSS 9100120)

As requested in your note of March 5, 1991, enclosed is an updated fact sheet. All updated information was collected and incorporated into your existing draft fact sheet via the 5520.

Original signed by G. A. Arlotto

Robert M. Bernero, Director
Office of Nuclear Material Safety
and Safeguards

Enclosure:
As stated

Distribution

NMSS r/f
JLinehan/HLW
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DHLWM r/f
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DATE	3/21/91	3/22/91				

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OFFICE OF NUCLEAR MATERIAL SAFETY AND SAFEGUARDS

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Robert M. Bernero, Director
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Enclosure:
As stated

C	HLPD	HLPD	LLWM	IMNS	HLWM:	HLWM:
ME	AGarcia	JHolonich	RBangart	RCunningham	JLinehan	JYoungblood
TE	3/14/91	3/18/91	3/18/91	3/18/91	3/ /91	3/ /91
C	NMSS	NMSS				
ME	GArlotto	RBernero				
TE	3/ /91	3/ /91				

RADIOACTIVE WASTE

Waste materials resulting from the civilian uses of nuclear energy can be separated into two main categories:

(1) Wastes--those materials which have insufficient remaining utility or insufficient recoverable value and which, because of their radioactive content, are potentially dangerous to the public and the environment and require special management and/or disposal procedures.

(2) Effluents--those materials routinely discharged to the air and water which meet limits for radioactive content established by the Nuclear Regulatory Commission. The NRC also requires that the radioactive content of effluents be as low as is reasonably achievable.

Kinds of Radioactive Waste

Radioactive waste is broadly classified as: (a) spent (used) nuclear fuel, (b) high-level radioactive waste, (c) transuranic (TRU) waste, (d) low-level radioactive waste, and (e) uranium and/or thorium mill tailings.

Spent nuclear fuel is that fuel which has been removed from a reactor because it no longer can sustain an efficient chain reaction. When removed from a reactor, it is highly radioactive and thermally hot and is stored in water-filled basins. The water serves to keep the fuel cool and shields workers from radiation. Once the fuel is sufficiently cooled, some utilities have elected to install dry storage technologies to supplement the storage capacity of their spent fuel pools. These storage facilities are independent spent fuel storage installations (ISFSI) at individual reactor sites or at one away-from-

reactor ISFSI located near Morris, Illinois. The Morris Facility is filled to capacity and no longer accepts additional spent fuel for storage. The Department of Energy estimates that there were about 18,000 metric tons of civilian spent fuel in storage at NRC-licensed nuclear power plants around the country in 1989 and that the amount will increase to about 32,000 metric tons by 1996.

High-level radioactive waste is generated from the reprocessing of spent nuclear fuel to separate the unfissioned plutonium and uranium from the radioactive waste products. Department of Energy statistics indicate that about two thousand cubic meters of civilian high-level radioactive wastes currently are in storage, primarily at West Valley, New York, site of a former reprocessing facility. At the present time, there is no civilian fuel reprocessing industry in the United States.

Transuranic (TRU) waste is material contaminated with certain radioactive materials--in concentrations of more than 100 nanocuries (100 billionths of a curie) per gram--which emit alpha radiation. Plutonium is one transuranic element. Almost all of the existing inventory of TRU waste in this country was generated in nuclear defense programs.

Low-level radioactive wastes result from the operation, maintenance and decommissioning of reactors and from the use of radioactive materials for

research, medical, industrial and other purposes. The NRC further divides low-level radioactive wastes into three Classes, A, B or C, depending on the concentration of radioactive material present. Class A wastes contain the lowest concentration and Class C the highest. The NRC and the Department of Energy data show that 1.6 million cubic feet of low-level waste was sent to three active disposal sites in 1989. Preliminary figures for 1990 indicate that the volume was somewhat lower. Of the amount, about 57 percent resulted from the operation and maintenance of reactors and about 43 percent from other uses. The largest, by volume, part of that total, 96 percent, was Class A waste; 3 percent was Class B; and 1 percent was Class C.

Uranium and thorium mill tailings are fine-grained sand-like materials that are byproducts of uranium and thorium ore mining and milling. They are produced in very large volumes and contain low concentrations of naturally occurring radioactive materials. The Department of Energy estimates that approximately 100 million cubic meters of uranium mill tailings had been generated in the United States by 1985 and that the amount would increase to 146 million cubic meters by the year 2000 and 266 million cubic meters by 2020.

High-Level Radioactive Waste, Spent Fuel and Transuranic Waste

This country's policies governing the disposal of spent fuel and/or high-level radioactive wastes are defined by the Nuclear Waste Policy Act of 1982 (NWPA), as amended in 1987. These forms of waste are highly radioactive and will remain radioactive for thousands of years. Isolation from the public and the environment will be required for very long periods of time. Protection of the public and the environment will be provided by engineered and natural barriers.

To provide the long-term isolation required, the NWPA specifies that these wastes--both civilian and defense--will be placed in deep-underground geologic repositories to be built and operated by the Department of Energy. As required by the 1987 amendments to the Nuclear Waste Policy Act, the Department has undertaken a program to determine the suitability of a site at Yucca Mountain, Nevada, for the first repository. If the Yucca Mountain site does not prove suitable, the Department will have to seek further guidance from the Congress. In addition, the Department will seek Congressional authorization to build and operate a monitored retrievable storage (MRS) facility for the interim storage of spent fuel pending completion of a repository facility. The DOE also has built a Waste Isolation Pilot Plant (WIPP) in New Mexico to demonstrate that defense-generated transuranic wastes can be disposed of safely in an underground repository.

The Nuclear Regulatory Commission is responsible for licensing and regulating the receipt and possession of high-level waste and spent fuel at privately-owned facilities and at certain facilities owned by the Department of Energy--including facilities used primarily for the receipt and storage of high-level waste and spent fuel resulting from activities licensed by the NRC, and facilities, other than research and development facilities, authorized for the express purpose of long-term storage of DOE-generated waste. These facilities would include the underground geologic repository and the Monitored Retrievable Storage Facility.

The Nuclear Regulatory Commission's requirements governing the disposal of high-level waste and/or spent fuel in a geologic repository are contained in Part 60 of the Commission's regulations. These requirements govern pre-

licensing activities, construction authorization, receipt and possession of spent fuel or high-level waste, decommissioning and termination of license.

In the pre-licensing consultation phase, the primary responsibility of the NRC is to review the DOE's Site Characterization Plan and to provide comments to the Department identifying specific objections, if any. In addition, the NRC staff will observe various activities such as in-situ exploration and testing at the depths at which waste will be placed. All prelicensing consultation activities are open to participation of the State of Nevada and units of affected local governments.

The Department completed its Site Characterization Plan for the Yucca Mountain site in December 1988 and the NRC staff completed its review of that document in July 1989. In its review, the staff identified two objections--one concerning the quality assurance program and the other relating to the process for designing the shaft to be used for underground exploratory work. DOE is presently making progress in working to resolve these objections.

At the construction authorization stage, the NRC staff will review the DOE's License Application. The results of the staff's reviews will be documented in a Safety Evaluation Report. Following a public hearing, the NRC will make a determination whether there is reasonable assurance that the facility can be built and operated so that the public health and safety, the environment and the National defense and security can be protected.

Prior to licensing the receipt and possession of high-level waste and/or spent fuel at a geologic repository, the NRC staff will review updated safety data supplied by the DOE and will offer an opportunity for a public hearing.

The same general procedures will apply if and when the Department of Energy seeks approval to decommission the facility or terminate the license.

NRC licensing requirements for a MRS are contained in Part 72 of the Commission's regulations. Again, the NRC staff would review safety and environmental information submitted by the DOE and the results of these reviews would be documented in a Final Safety Analysis Report and Final Environmental Statement and an opportunity for public hearing would be offered. Approval to operate a MRS would depend on an agency determination that there is reasonable assurance that the public health and safety, the environment and the National defense and security would be protected.

In the absence of an underground geologic repository or a Monitored Retrievable Storage Facility and in view of the limited amount of space in their spent fuel storage basins, many utilities operating nuclear power plants are looking at alternative means of storing spent nuclear fuel on site, primarily dry-cask, air-cooled storage facilities. By the end of 1990, the NRC staff had approved nine dry storage designs for use at licensed-nuclear power plant sites and had licensed their use at three sites--Virginia Power Company's Surry Nuclear Power Plant in Virginia, Carolina Power and Light Company's H. B. Robinson Nuclear Power Plant in South Carolina and Duke Power Company's Oconee Nuclear Power Plant in South Carolina. Additionally, four applications were pending to use dry-cask storage designs--for Carolina Power and Light Company's Brunswick Nuclear Power Plant in North Carolina, Baltimore Gas and Electric Company's Calvert Cliffs Nuclear Power Plant in Maryland, Public Service Company of Colorado's Fort St. Vrain Nuclear Power Plant in Colorado, and Northern States Power Company's Prairie Island Nuclear Power Plant in Minnesota.

In 1990, Part 72 of the Commission's rules were amended to allow power reactor licensees to use NRC-certified storage casks on the reactor site without seeking a site-specific license. Four casks were certified by this rule change. Several applications for Cask Certification are expected in 1991.

In addition to the Nuclear Regulatory Commission and the Department of Energy, two other agencies have responsibilities related to the management and disposal of high-level waste and spent fuel. The Environmental Protection Agency establishes generally-applicable standards governing releases of radioactivity resulting from these activities. The Department of Transportation regulates the transportation of these materials, including the establishment of limits for external radiation levels and contamination on packages, controls over the mechanical condition of carrier equipment and qualifications of carrier personnel. Packages also must meet internationally developed standards and designs must be reviewed and approved by the NRC staff.

Low-Level Radioactive Waste

At the present time, low-level radioactive wastes are disposed of in three near-surface disposal facilities located near Barnwell, South Carolina; Beatty, Nevada; and Richland, Washington. Since all three sites are located in Agreement States (States which have assumed by agreement part of the NRC's regulatory authority), they are licensed by the individual States, not the NRC. However, at the Richland and Barnwell sites, the NRC regulates the disposal of

special nuclear material (defined in the Atomic Energy Act of 1954, as amended, as uranium enriched in the 233 or 235 isotope or plutonium) because the quantities received by the commercial operators exceed the quantities which Washington and South Carolina can regulate under their agreements with the NRC.

There are three other sites which previously received low-level radioactive wastes for disposal but have been closed for several years. They are located at Maxey Flats near Morehead, Kentucky; West Valley, New York; and Sheffield, Illinois.

United States' policies governing the disposal of low-level radioactive waste are governed by the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985. This legislation provides that the individual States, preferably acting together in regional compacts, are to provide disposal capacity for the low-level waste generated within their boundaries.

By the end of 1990, nine compacts had been formed and received the consent of Congress:

The Northwest Compact includes the States of Alaska, Hawaii, Idaho, Montana, Oregon, Utah and Washington with Washington as the host State using the existing disposal facility near Richland.

The Rocky Mountain Compact includes Colorado, Nevada, New Mexico and Wyoming and Nevada is currently the host State using the existing site at Beatty until 1992. The Northwest compact is currently negotiating with the Rocky Mountain Compact to receive the latter's waste after 1992.

The Central Compact includes Arkansas, Kansas, Louisiana, Nebraska and Oklahoma, Nebraska is the host State and a disposal site has been selected near Butte in North Central Nebraska

The Midwest Compact has been formed by Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio and Wisconsin; Michigan has been selected as the host State.

The Central-Midwest Compact is comprised of Illinois and Kentucky with Illinois the designated host State. A site has been selected near Martinsville, Illinois by the Illinois Department of Nuclear Safety for licensing consideration. An independent siting commission is considering the recommendation.

The Southeast Compact is made up of Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee and Virginia with South Carolina the current host State using the existing disposal facility near Barnwell. North Carolina has been designated to replace South Carolina as the host State by 1992.

The Northeast Compact includes Connecticut and New Jersey. Both New Jersey and Connecticut are to be host States.

The Appalachian Compact includes Delaware, Maryland, Pennsylvania and West Virginia with Pennsylvania as the designated host State.

The Southwestern Compact includes the host State California together with Arizona and North and South Dakota. A site in Ward Valley near Needles has been selected for the disposal facility.

Seven States--Maine, Massachusetts, New Hampshire, New York, Rhode Island, Texas and Vermont--and the District of Columbia and the Commonwealth of Puerto Rico remain unaffiliated. Maine, Massachusetts, New York, Texas, and Vermont are planning to dispose of their own low-level waste.

The technical requirements which have to be met to provide reasonable assurance that a low-level radioactive waste disposal facility can be built and operated safely are contained in Part 61 of the NRC's regulations. While the NRC's present requirements governing the disposal of low-level radioactive wastes contemplate the use of near surface disposal facilities, the Low-Level Radioactive Waste Policy Amendments Act requires the Commission to provide guidance to individual States and compacts on alternative disposal methods such as earth mounded concrete bunkers and below ground vaults. The staff has prepared a standard format and content guide for applications to develop a near surface disposal facility meeting Part 61 requirements as well as a standard plan for staff review of such applications. Staff has also issued revisions to these documents which are applicable to the earth-mounted concrete bunker and below-ground vault alternatives. Applications involving the use of other technologies can be considered on a case-by-case basis.

FULL TEXT ARCHIVE

Low-level radioactive wastes with concentrations of radioactive materials greater than those defined as Class C generally are not considered suitable for disposal in a low-level radioactive waste disposal facility. Accordingly, the Low-Level Radioactive Waste Policy Amendments Act requires that these "greater-than-Class C" wastes be disposed of by the Federal Government and the Department of Energy is the responsible "Federal Government" agency. The same legislation also requires that "greater-than-Class C" wastes generated as the result of activities licensed by the NRC be disposed of in a facility licensed by the NRC. As of the end of 1990, the Department of Energy had not identified the options for eventual disposal of these particular wastes though NRC regulations require that greater-than-class-C wastes be disposed of in a geologic repository designed for the disposal of high-level radioactive wastes unless the Department of Energy proposes an alternative. The Department of Energy has estimated that the total volume of "greater-than-Class C" will be about 2000 cubic meters by the year 2020 and most of that will result from the decommissioning of licensed nuclear power plants.

Mill Tailings

The Uranium Mill Tailings Radiation Control Act of 1978 provides the framework for assuring that mill tailings located at active and inactive mill sites are stabilized and controlled or disposed of in a way that will be environmentally sound and will assure that radiation exposures to the public will be minimized or eliminated. Basically, the legislation requires the NRC to be responsible for NRC-licensed mill sites or sites which were under NRC license at the time legislation was enacted. The Department of Energy is responsible for taking actions at inactive sites with the concurrence of the NRC to ensure that the applicable EPA standards are met.

The NRC's requirements governing the NRC licensed activities are contained in Appendix A to Part 40 of the Commission's regulations. The requirements include: 1) limiting the emanation of radon from disposed tailings; 2) ensuring long-term stability of tailings; 3) ensuring clean-up of dispersed materials; and 4) ensuring that groundwater is adequately protected.

In addition, Appendix A contains financial criteria designed to assure that sufficient funds will be available to carry out the decontamination and decommissioning of the mill and site and for the reclamation of any tailings or waste disposal areas. One of the criterion provides for a minimum charge of $250,000 to be paid to the United States Treasury or to an appropriate State agency prior to the termination of a mill license to cover the cost of long-term surveillance of the site. Finally, there are requirements for assuring that, prior to license termination, ownership of the tailings and the site will be transferred to the U.S. Government or an appropriate State government and for assuring long-term surveillance of the site.

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