DOE/RW-0098

OCRWM Backgrounder

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Office of Civilian Radioactive Waste Management
Washington, D.C. 20585

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ACTIVITIES DURING THE SITE CHARACTERIZATION PHASE OF THE GEOLOGIC REPOSITORY PROGRAM

BACKGROUND:

The site characterization phase of the geologic repository program includes two kinds of activities: (1) a program of extensive field and laboratory testing and studies to collect and evaluate geologic, hydrologic, and geochemical information (in this paper, those studies are referred to as site characterization); and (2) environmental and socioeconomic studies that assess the potential impacts of repository development and operation. The site characterization phase is expected to last about five years and cost as much as $1 billion for each site (in 1985 dollars). As many as 200-500 people will be employed at each site at the peak of site characterization activity.

SITE CHARACTERIZATION:

Overview

The objectives of the site characterization program are to: (1) determine the geologic, hydrologic, and geochemical conditions at a candidate site; (2) provide information needed to design a package for the disposal of spent fuel and high-level radioactive waste that will meet the licensing requirements of the U.S. Nuclear Regulatory Commission (NRC); (3) provide information for the design of the repository facility; and (4) evaluate whether the site can meet the requirements of NRC and the Environmental Protection Agency.

The program will consist of surface based investigations (such as geologic mapping, geophysical surveys, and seismologic, paleoclimatologic, and hydrologic studies), as well as subsurface investigations conducted by means of deep and shallow boreholes that will be used for ground water monitoring, core extraction, laboratory testing, and stratigraphic, tectonic, geochemical, and geohydrologic studies. Most important, investigations will be conducted in the host rock at repository depth through construction and use of exploratory shafts and underground test facilities. Geochemical studies of the host rock and surrounding strata will assess the effect of the in-situ environment on the waste package, ability of the host rock to contain radionuclides, and ability of surrounding units to retard radionuclides by chemical interaction.

(MORE)

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Hydrologic testing and monitoring of surface and subsurface water flow systems will assess surface flooding potential and help in the construction of computer models that will analyze subsurface hydrologic flow systems and their potential for transporting radionuclides.

Although site evaluation studies comparable to the site characterization activities in the repository program are commonly conducted in preparing environmental impact statements for large construction projects such as dams and power plants, site characterization for a repository departs from those studies in that it requires the sinking of a deep exploratory shaft to conduct preliminary tests in the repository host rock. However, there is considerable experience with deep shaft construction. The mining industry frequently constructs deep shafts to extract minerals. For example, the Stripa Mine in Sweden was excavated to a depth of 1150 feet in saturated rock. Furthermore, the Climax Stock mine, near the Nevada Test Site, was excavated to a depth of 1400 feet in unsaturated rock.

Exploratory Shafts

The Department is planning to sink two exploratory shafts at each candidate site. Having a second shaft is necessary for the safety of operating personnel.

At the Deaf Smith County, Texas site, shafts will be constructed by drill-and-blast techniques. They will be sunk to depths ranging between 2,600 and 3,000 feet, with horizontal workings (sub-surface facilities and ventilation tunnels) extending about 5400 feet from the base of the shafts. The shafts will penetrate the Ogallala and Dockum aquifers as they are sunk to repository depth. To control water migration and to stabilize the ground during this operation, portions of the ground will be frozen to ensure isolation of the aquifers. Ground freezing is a well documented procedure used in the mining industry. The frozen ground will be maintained until the final concrete lining is emplaced.

At the Hanford, Washington site, shafts will be drilled, using a large drill rig. Shafts will be sunk to the candidate repository depth, or approximately 3000 and 3400 feet. The shafts will be lined with water tight steel casing and sealed in place with a cement grout. Effectiveness of the seal to prevent water intrusion will be verified before beginning horizontal excavations at repository depth.

At the Yucca Mountain, Nevada site, the planned exploratory shaft will use drill-and-blast techniques. Shaft depths will be approximately 1200 and 1500 feet. The Yucca Mountain site is different from the other sites in that, from the surface to repository depth, the rock is unsaturated. Water will be used sparingly during shaft construction so that tests to characterize the unsaturated zone will not be affected. The liners for the first shaft will be concrete, with the possibility of steel being used for the second shaft. Underground test facility rooms will be excavated at about the 500-foot level and at the shaft bottom.

The exploratory shafts will be incorporated into the repository design after a site is found suitable and is selected for development as the repository. If a site is not selected for further development, the shafts will be filled and sealed, and the site will be restored as nearly as possible to its original condition.

Site Characterization Plans

Prior to exploratory shaft construction at each candidate site, the Secretary of Energy will submit a Site Characterization Plan (SCP) to the NRC, the Governor, and legislature of the State in which such candidate site is located, the governing body of affected Indian Tribes, and the public. The site plans are scheduled to be issued on the following dates: Hanford and Yucca Mountain in December 1986; and Deaf Smith County in April 1987. A three month public comment period, including public hearings, will follow the issuance of each SCP.

The "Annotated Outline" for the SCP, derived from the NRC's Regulatory Guide 4.17 (Standard Format and Content of Site Charactérication Plans for High-Level Waste Geologic Repositories), was approved by the NRC and distributed to other recipients. The outline is divided into two parts: Part A that describes the candidate site, the waste package, and the repository; and Part B that presents the site characterization program. Part A will be devoted to the presentation of existing information pertaining to geology, geoengineering, hydrology, geochemistry, climatology and meteorology. Part B will be the heart of the SCP. It will be composed of: (1) the rationale for the planned site characterization program; (2) issues to be resolved and information required during site characterization; (3) planned tests, analyses, and studies; (4) planned site preparation activities; (5) milestones, schedules, and decision points; (6) quality assurance activities; and (7) the decontamination and decommissioning activities related to the repository.

ENVIRONMENTAL AND SOCIOECONOMIC STUDIES:

In parallel with the site characterization program, DOE will conduct environmental and socioeconomic studies to assess the potential impacts of repository development and operation. These studies will support the preparation of the Environmental Impact Statement (EIS) for the site that is ultimately selected and the development of plans to mitigate any significant adverse impacts. The environmental studies will also evaluate whether repository development and operation can be conducted in compliance with environmental regulatory requirements.

Environmental data collection and analysis will focus on land use and mineral resources, terrestrial and aquatic ecosystems, and ecology, threatened and endangered animal species, air quality and meteorology, surface waters and water quality, soils, and noise. Aesthetics, archeological, cultural, and historical resources, background radiation, and transportation systems affected by repository development will also be studied. Socioeconomic studies will address potential demographic and economic impacts, as well as changes in community services, social conditions, fiscal conditions, and government organization.

Plans will be developed and implemented to detect significant adverse environmental and socioeconomic impacts resulting from site characterization activities. These plans, that will be developed in consultation with the affected States, Indian Tribes, and local governments, will also identify procedures for developing and implementing programs to mitigate significant adverse impacts.

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OCRWM Backgrounder

United States Department of Energy
Office of Civilian Radioactive Waste Management
Washington, D.C. 20585

COOPERATIVE DEMONSTRATION PROJECTS FOR SPENT NUCLEAR FUEL

INTRODUCTION:

The U.S. Department of Energy (DOE) is implementing, in cooperation with the nuclear power industry, several technology demonstration projects designed to assist utilities in enhancing spent fuel storage capacity at nuclear reactor sites.[1] The primary objectives of the cooperative demonstration projects, in accordance with Section 132 and Section 218 of the Nuclear Waste Policy Act (NWPA) of 1982, are to encourage and to expedite the efficient use by the utilities of existing storage facilities and to provide technologies for adding new storage capacity.

Until DOE accepts the spent fuel for disposal at an NWPA facility, nuclear utilities have the primary responsibility for the storage of their spent fuel and for the effective use of that storage capacity. By focusing on demonstration projects in cooperation with utilities that have expressed a high degree of interest in specific technologies, the storage concepts developed will be those that most appropriately address the needs of the utilities.

STORAGE OF SPENT FUEL:

Spent fuel assemblies removed from nuclear reactors are stored temporarily in water pools that cool the spent fuel rods and shield workers and others at the site against radiation. Many of these storage pools were intended originally for short-term storage, and their capacities are generally limited. Some utilities, faced with potential spent fuel storage problems, have developed and subsequently obtained approval from the U.S. Nuclear Regulatory Commission (NRC) for various methods of extending their on-site storage capacity.

One method employed by the utilities is the "reracking" of fuel assemblies in storage pools to obtain greater storage densities. By changing the configuration of the racks that hold the spent fuel in the storage pools, and by adding neutron-absorbing material, it is possible to store more than double the fuel that had been held in the originally designed racks. Another method,

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1/ Spent nuclear fuel refers to fuel that has been removed from a nuclear reactor core primarily because it can no longer sustain an efficient chain reaction. High-level radioactive waste, generated from the reprocessing of spent nuclear fuel to extract plutonium and the remaining usable uranium, results largely from defense nuclear activities.

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called "transshipping," involves transporting spent fuel from reactor sites with storage limitations to other reactor sites of the same utility that have available storage capacity.

CURRENT DEMONSTRATION PROJECTS:

DOE's Office of Civilian Radioactive Waste Management (OCRWM) is implementing the provisions of the NWPA that are designed to establish, in cooperation with the utilities, new technologies for on-site dry storage and consolidation of spent fuel. The efficient use of existing storage facilities and the addition of new at-reactor storage capacity will be enhanced through the following activities:

- a cooperative demonstration program with the private sector to:
  - demonstrate spent fuel rod consolidation in existing storage pools and in a dry environment; and
  - develop dry storage technologies that the NRC may, by rule, approve for use at civilian reactor sites.
- consultative and technical assistance to utilities on a cost shared basis to assist the utility in obtaining NRC licensing and construction authorization for the application of new technologies; and
- a cost shared research and development (R & D) program at Federal facilities to collect the necessary data to assist the utilities in the licensing process.

OCRWM is currently supporting cooperative demonstrations of rod consolidation and dry storage with several utilities. In addition, OCRWM is conducting spent fuel research and development to provide data to the utilities for obtaining licenses for these new technologies. These cooperative R&D activities are intended to establish one or more technologies that the NRC may approve by rule for use at reactor sites without, to the maximum extent practicable, the need for additional site-specific approvals.

Rod Consolidation Cooperative Demonstration Projects

Rod consolidation differs from reracking in that rod consolidation involves dismantling the fuel assemblies, and placing them in canisters, whereas reracking places the intact assemblies in reconfigured storage racks that are designed for higher storage densities. Rod consolidation may be done in a storage pool, or it may be done in a dry environment. Rod consolidation increases the capacity of spent fuel storage pools that have sufficient structural strength to safely support a more compact array of spent fuel rods that have been separated from their associated hardware components.

In 1981, DOE successfully completed a "cold" (non-radioactive) demonstration of prototypical rod consolidation equipment. In May 1983, DOE issued a solicitation for cooperative agreement proposals for in-pool rod consolidation demonstrations that could provide a basis for future licensing by the NRC. A cooperative agreement for a rod consolidation demonstration project has been negotiated with the Northeast Utilities Services Company of Hartford, Connecticut. After the completion of the cooperative demonstration project, DOE expects to assemble a data base that will provide sufficient data for the utilities to apply for licensing of rod consolidation for commercial use.

OCRWM has initiated research and demonstration of equipment and methods for dry rod consolidation of spent fuel at the Idaho National Engineering Laboratory (INEL). The purpose of this demonstration, which is known as the Prototypical Consolidation Demonstration Project, PCDP, is to show that dry rod consolidation is feasible on a production line scale for use at NWPA facilities, including the repository or the monitored retrievable storage (MRS) facility, if authorized by Congress. The PCDP consists of four sequential phases that will lead to a planned demonstration of the process in 1989.

OCRWM has two new rod consolidation projects that are in the planning phase. The first one is known as the Non-fuel Bearing Component Volume Reduction Demonstration. The objective of this project is to design new equipment that will reduce the overall bulk of residual nonfuel hardware and other parts. The second project will be a canister welding project to test various methods of sealing canisters containing spent fuel rods from a rod consolidation process. These two projects are to be initiated in Fiscal Year 1989 and are expected to be completed several years later.

Dry Storage Cooperative Demonstration Projects

Dry storage systems provide a fuel storage alternative when reracking or rod consolidation cannot be undertaken because of economic, seismic, or structural limitations of spent fuel storage pool systems. Systems for dry storage include casks, drywells, silos, and vaults. Casks are large metal containers with radiation shielding that are stored above ground. Drywells are below-grade wells with steel and concrete lining that are designed to hold one or more spent fuel assemblies; the surrounding earth provides an additional radiation barrier, as well as a medium for conducting heat from the dry well. Silos are concrete cylinders built above ground that provide sealed secondary containment for spent fuel. Vaults are large concrete structures that use natural air convection for cooling. All of these dry storage systems are designed to have low maintenance requirements and to be modular in order to provide additional capacity as required.

DOE has extensive experience in conducting demonstrations of dry storage systems for spent fuel. Drywell, silo, and vault storage systems have been demonstrated at several DOE facilities in Nevada. However, dry storage systems demonstrated under the Department's auspices have never been licensed by the NRC for commercial use.

A solicitation for cooperative agreement proposals for licensed dry-storage demonstrations was issued by DOE in May 1983, leading to cooperative agreements that were negotiated with the Virginia Electric Power Company and the Carolina Power & Light Company in March 1984. At Virginia Power's Surry Nuclear Plant, construction of an independent spent fuel storage installation has been completed, and NRC issued a license for the system in July 1986.

DOE's agreement with Carolina Power & Light (CP&L) provides for a licensed demonstration of dry storage in horizontal, modular concrete silos at the site of the H.B. Robinson plant in South Carolina. On March 28, 1986, NRC approved the topical report prepared on CP&L's demonstration. Licensing of CP & L's Independent Spent Fuel Storage Installation is imminent, and construction is expected to begin in the near future.

OCRWM has also initiated dry storage technology research and demonstration activities at DOE's Idaho National Engineering Laboratory (INEL). Spent fuel assemblies from the Surry plant were shipped to INEL for an unlicensed demonstration of dry storage casks and to conduct tests under situations that approach the bounding parameters and limiting conditions of dry storage. Initial testing has been completed at INEL on dry storage casks of three different designs and manufacture; long-term monitoring is now in process.

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OCRWM Backgrounder

United States Department of Energy
Office of Civilian Radioactive Waste Management
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STUDIES OF ALTERNATIVE METHODS OF RADIOACTIVE WASTE DISPOSAL

INTRODUCTION:

The Nuclear Waste Policy Act (NWPA) of 1982, signed into law by the President on January 7, 1983, establishes a national policy for the safe storage and permanent disposal of spent nuclear fuel and high-level radioactive waste (HLW).[1] The NWPA directs the U.S. Department of Energy (DOE) to develop and operate a system of waste disposal that emphasizes the use of deep-mined geologic repositories. Prior to the passage of the NWPA, DOE assessed the use of geologic repositories and other nuclear waste disposal alternatives in an Environmental Impact Statement (EIS) titled, the Management of Commercially Generated Radioactive Waste (DOE/EIS-0046F, October 1980). The EIS evaluated the following alternatives to deep-mined geologic repositories: subseabed disposal, emplacement in very deep hole, rock melt, island-based geologic, ice sheet, deep-well injection, and space disposal, as well as the transmutation waste-form treatment, and indefinite surface storage. This paper provides an overview of these nuclear waste disposal alternatives.

SUBSEABED DISPOSAL:

The basic subseabed disposal concept involves the burial of solidified waste inside high integrity canisters beneath the ocean floor. Disposal would occur in the tectonically stable clay-rich sediments of the mid-plate regions beneath the ocean floor. By emplacing the waste in these mid-plate regions, it is expected that the waste would remain isolated from the biosphere for extremely long periods of time and, therefore, would not present a threat to oceanic flora and fauna. The movement of any waste isotopes escaping from the ocean sediments to the biologically active near-surface water is expected to be a slow process, accompanied by dilution and dispersion. In addition, the great depth of water would constitute a barrier to human intrusion.

Several potential problems remain, however, most importantly, the feasibility of executing the concept has not been established. For example, it may be difficult to emplace the waste containers beneath the ocean

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1/ Spent nuclear fuel refers to that fuel which has been removed from a nuclear reactor core because it can no longer sustain an efficient chain reaction. High-level radioactive waste, generated from the reprocessing of spent nuclear fuel to extract plutonium and the remaining usable uranium, results largely from defense nuclear activities.

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floor to assure containment until the waste decays to acceptably low levels. Additionally, the radionuclides may be altered by chemical reactions with the sediments. Even if subseabed disposal proved technically feasible, it may be difficult to develop an effective international, legal, and administrative structure to regulate and monitor a subseabed repository.

The Subseabed Disposal Program, a joint research effort of DOE, the Environmental Protection Agency, other Federal agencies, and international organizations (e.g., the Nuclear Energy Agency of the Organization for Economic Cooperation and Development) has been an on-going program since 1974. However, recent and projected budget limitations on research and development expenditures have resulted in a reassessment of this program. As a result of this review, DOE did not request funds for the Subseabed Program in its fiscal year (FY) 1987 budget request to Congress. The DOE's Office of Civilian Radioactive Waste Management (OCRWM) plans to conduct an orderly closing of the project while preserving the scientific information for future use.

DEEP HOLE DISPOSAL:

The very deep hole concept involves the placement of waste canisters as far as 10,000 meters (approximately six miles) underground, a considerable distance away from the accessible environment and below circulating groundwater. At this depth, the nuclear waste may be effectively contained as the waste decays to levels or stable forms that pose little threat to human health. To serve as a waste repository at those depths, the host rock must retain its character and structural stability under the heat and radiation conditions introduced by the waste.

The very deep hole disposal concept was not defined as a proposed action in the EIS for the following reasons: the incomplete understanding of the hydrologic characteristics of deep crystalline and sedimentary rock units; the technical uncertainty associated with current drilling technologies that would have to be used to attain the extreme depths required to isolate nuclear waste from the biosphere; and the lack of knowledge of in-situ rock mechanical properties under high pressure and temperature conditions.

ROCK MELT DISPOSAL:

The rock melt disposal of nuclear waste involves the emplacement of waste which would be in a liquid or slurry form into a deep underground hole or cavity. After the water in the waste has evaporated, the surrounding rock would melt from the heat generated by the decay of radioactive waste. This process, in turn, would slowly dissolve the waste. The waste rock solution would slowly solidify, trapping the radioactive material in a relatively insoluble form deep below the surface of the Earth. The waste rock solidified conglomerate that would ultimately result is expected to be extremely leach resistant and, hence, could provide greater long-term containment of waste isotopes than a mined geologic repository. Because less mining activity would be involved than in a mined geologic repository, the relative cost advantages of this concept could be substantial.

The rock melt disposal concept was not defined as a proposed action in the EIS largely because of the time required to monitor the process prior to full solidification of the nuclear waste. About 1,000 years would elapse before total solidification would occur. A lack of understanding of the heat transfer and phase-change phenomena in rock--information necessary to establish the stability of the molten rock matrix and to develop engineering methods for emplacement--would further complicate the monitoring task.

ISLAND GEOLOGIC DISPOSAL:

The island geologic disposal concept involves the siting of deep-mined geologic repositories in islands. Preferred island locations are those located in remote areas and devoid of known natural resources. Uninhabited islands that are hydrologically separated from large continental land masses offer potential advantages. Potentially adverse radiological health effects would be minimized. Further, any leakage of radioactivity into the island's groundwater could be easily detected. Additionally, in the event of high-level radioactive waste leakage into the environment, the waste would be diluted by the surrounding seawater.

Drawbacks of the island geologic disposal concept include the risks associated with ocean transport of nuclear waste during adverse weather conditions. Additionally, many islands experience frequent and intense seismic and volcanic activity. Such activity could discharge the waste into either lava flows or into the atmosphere. Moreover, islands of volcanic origin have geologic foundations that are permeable and, hence, susceptible to interaction of fresh and marine water. The presence of water could contribute to corrosion of waste canisters, leaching, and the eventual transport of radionuclides into the biosphere. Potential opposition from countries in the vicinity of a proposed island repository is an additional consideration.

ICE SHEET DISPOSAL:

Without significant climatic changes, the Antarctic and the Greenland ice caps could provide long term isolation of nuclear waste from the biosphere. Three ice sheet emplacement concepts have been considered: passive slow descent; anchor; and surface storage. Passive emplacement would allow for the waste canister to be placed in a shallow hole, eventually melting its way to the bottom of the ice sheet as heat is emitted from the radioactive decay process. Anchor emplacement parallels that of passive emplacement, but an anchor cable attached to the canister would limit the descent depth and allow retrieval of the waste canister. The surface storage concept requires the use of large storage units constructed above the snow surface and then filled with waste. The radioactive waste would act as a heat source causing the storage units to slowly melt their way to the bottom of the ice sheet.

An advantage of the ice sheet disposal concept is that the polar regions are uninhabited and desolate areas that would provide for the almost total isolation of the nuclear waste. The ice masses are thousands of meters thick, extend uniformly, and remain stable for long periods of time. At great depths (100 meters or more), ice behaves like a plastic and flows to seal fissures and close cavities. Isolation of radioactive wastes would be assured for long periods of time due to the very slow flow of ice.

Disadvantages of the ice sheet disposal concept include uncertainties surrounding both the disposal technologies and impact of future climatic changes on the stability and size of the ice sheets. Another disadvantage is the expected high operational costs of ice sheet disposal because of the remoteness of the locations and the adversity of weather conditions. Ice sheet dynamics are not well known. Global climatic effects could accelerate the melting of large portions of ice masses from the heat generated from radioactive waste decay and open paths to the dispersion of waste. Finally, the Antarctic Treaty of 1959, of which the United States is a signatory, specifically prohibits the disposal of nuclear waste in the Antarctic.

DEEP-WELL INJECTION:

The deep-well injection concept is the emplacement of liquid or slurried nuclear waste into deep geologic formations capped by an impermeable boundary layer. For acidic liquid waste, the method would involve pressurized pumping of the waste to depths of 1,000 to 5,000 meters (3,300 to 16,000 feet) into a porous or hydrofractured geologic formation suitably isolated from the biosphere by overlying strata that are relatively impermeable. The waste would progressively disperse throughout the host rock. Deep-well injection is a working technology compared to those required to implement the rock melt and deep hole disposal concepts. Shale is considered a suitable geologic medium because of its ability to provide isolation of waste from groundwater and the environment.

The deep-well injection alternative requires either mechanical or chemical processing of spent fuel prior to its disposal which is a possible drawback. Another possible limitation of the deep-well injection method concerns the mobility of a liquid waste form within a porous host rock formation. The combination of a liquid waste form and a porous rock body increases the chances that the waste could come into contact with the biosphere.

SPACE DISPOSAL:

The National Aeronautics and Space Administration (NASA) and DOE have studied several space disposal concepts including, the transport to and injection of nuclear waste into the sun, and the emplacement of waste on the Earth's moon. These methods were found unsuitable for technical and space exploration reasons. Another concept involved sending reprocessed nuclear waste into a circular solar orbit about midway between Earth and the planet Venus. First, the space shuttle would carry the nuclear waste package to low Earth orbit. A transfer vehicle would then separate from the shuttle to place the waste package and another propulsion stage into an Earth escape trajectory. The transfer vehicle would return to the shuttle while the remaining rocket stage would move the waste into solar orbit.

Disadvantages of the space disposal concept include the possibility of launch failure and the potential inability of the waste packaging system to contain the waste in the event of such a failure. Additionally, the costs of launching nuclear waste into space would be very high. Therefore, the space disposal concept would be restricted to providing for the extraterrestrial isolation of long-lived radionuclides, such as Iodine^{129} and Technetium^{99}. In turn, this would require the reprocessing of high-level radioactive waste into specially tailored waste forms. Waste remaining on earth would have to be disposed of in a mined geologic repository. The use of extraterrestrial disposal, in conjunction with terrestrial disposal, would require an expected extra cost without achieving a significant reduction in long-term risk over emplacement of waste only in a mined geologic repository. Consequently, in April 1982, NASA and DOE agreed to discontinue further study of the extraterrestrial nuclear waste disposal concept.

TRANSMUTATION:

Transmutation is not a disposal method, but a treatment method for high-level radioactive waste that would be used in conjunction with specific disposal alternatives, such as the deep-mined geologic disposal option.
The trasmutation concept involves the reprocessing of spent fuel to recover uranium and plutonium (or processing to obtain a liquid high-level waste stream in the case where uranium and plutonium are not to be recycled). The remaining high-level waste stream is partitioned into an actinide[2] waste stream and a fission product stream. The fission product stream is concentrated, solidified, and sent to a mined geologic repository for disposal. The actinide waste stream is combined with uranium or uranium and plutonium, fabricated into fuel rods, and reinserted into a reactor. In the reactor, about 5 to 7 percent of the recycled waste actinides are transmuted to stable or short-lived isotopes, which are separated out during the next recycle step for disposal in the repository. Numerous recycles would result in nearly complete transmutation of the waste actinides; however, additional waste streams are generated with every recycle. Transmutation provides no reduction in the quantities of long-lived fission product radionuclides such as Technetium^{99} and Iodine^{129} in the fission product stream that is sent to geologic disposal.

SURFACE STORAGE:

The surface storage alternative would allow for existing spent fuel to be left indefinitely where it is being stored. Any additional waste discharges from the operation of commercial nuclear power plants would be stored indefinitely in water basin facilities at the reactors or at other sites. Reprocessing of wastes is assumed not to be undertaken. This alternative would allow for delays and contingencies that could not have been foreseen in the research, development, and planning stages for deep-mined geologic disposal.

Disadvantages associated with the surface storage alternative include the extensive maintenance and monitoring activities that necessarily accompany surface storage, as well as the potential health and safety, and environmental risks attendant to storing nuclear waste in relatively accessible locations.

2/ Actinides are a group of elements that include uranium and all man-made transuranic elements (e.g., Berkelium and Californium). Fission products are nuclei (fission fragments) formed by the fission of heavy elements, plus the nuclides formed by the fission fragments' radioactive decay.

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OCRWM Bulletin

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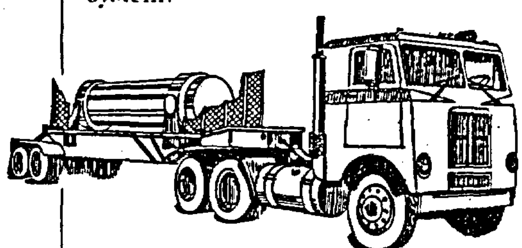
Office of Civilian Radioactive Waste Management
Washington, D.C. 20585

September 1986

Transportation Institutional Plan Issued

A primary element of the OCRWM program is the development of the transportation system required to support the waste management system.



The "Transportation Institutional Plan" (DOE/RW-0094) issued in August, has been developed to lay the foundation for interaction among all interested parties to identify and address major transportation issues. A draft plan was issued in September 1985 for comment, and a workshop was held in November 1985. The comments received were considered carefully in the development of the "Transportation Institutional Plan."

The plan is divided into three chapters. Chapter 1 provides background information, discusses the purposes of the plan and the policy guidance for establishing the transportation system, and describes the projected system and plans for its integrated development. Chapter 2 discusses the major participants who must interact to build the system. Chapter 3 suggests mechanisms for interaction that will foster wide participation in program planning and implementation and provides a framework for managing and resolving issues related to the development and operation of the transportation system. *(continued on page 5)*

In This Issue

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Designing a Licensing Support System

To fulfill its responsibility, OCRWM must demonstrate compliance with all applicable regulations and obtain necessary licenses and permits.

Demonstrating compliance with regulations requires close and continuous interactions among (1) licensing engineers who know what must be proven, the acceptable bases for proof, and the kinds of information needed; (2) designers and analysts responsible for performing the required work needed for the license application; and (3) technical specialists responsible for data acquisition. In addition, important interactions occur between OCRWM technical staff, the Nuclear Regulatory Commission (NRC), and other Federal, State, Indian Tribal, and local government personnel.

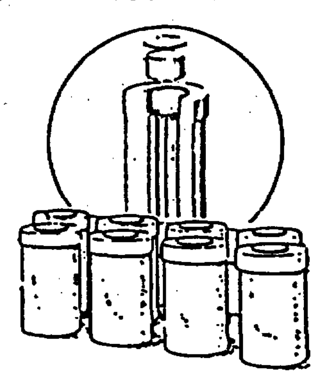
Sophisticated and interactive information systems are needed to assist in this coordination. The systems must also fill technical and managerial information needs for securing a geologic repository license and provide a permanent record of licensing activities. These systems are known as the Licensing Support System (LSS). Any system as complex as the LSS, and involving so many parties with different information needs, is difficult to define in its early stages. In general, however, the LSS concept includes among various possibilities:

1. Document Access—to serve as a comprehensive technical and administrative data/documentation file.
2. Issues Tracking—to define the respective roles of Headquarters and the Project Offices in resolving repository licensing issues, and to provide an overall DOE licensing issue tracking capability.
3. Commitments Tracking—to record the formal commitments that DOE has made to the NRC and to the affected States or Indian Tribes relating to repository licensing and permitting.
4. Regulations Access—to collect applicable Federal, State, and local requirements to ensure compliance.

As the design of the LSS evolves, DOE is committed to interact with the NRC and with representatives of the affected States and Indian Tribes so that the requirements of the parties can be factored into the design. These interactions will be coordinated through the DOE/NRC Interagency Coordinating Committee, status briefings with the affected States and Indian Tribes and the NRC, and ultimately through a rule-making proceeding that the NRC is preparing to conduct. ☆

Virginia Power Independent Spent Fuel Storage Installation Dedicated

On August 26, 1986, at the Surry Plant of Virginia Power, a major event in the Nation's nuclear waste disposal program occurred with the dedication of an Independent Spent Fuel Storage Installation. This is the first aboveground dry cask facility for storing high-level spent nuclear fuel in the United States.



The availability of this storage facility means that Virginia Power will not have to ship spent fuel from the Surry Plant some 120 miles to its other nuclear station, North Anna, in Louisa County. Virginia Power has room for 28 storage casks on a concrete pad adjacent to the plant. The dry casks will be cheaper than pools and will require less monitoring by employees.

Virginia Power recognized its own storage needs, initiated development of spent fuel storage technologies, and in October 1982, submitted an application to the NRC to license the dry cask storage facility. In 1984, DOE, Virginia Power, and the Electric Power Research Institute (EPRI) entered into a cooperative demonstration program leading to the design, licensing, construction, and operation of the dry cask storage facility.

Consistent with the Cooperative Demonstration Program of the NWPA that limited DOE's share of the total, DOE contributed about 25 percent, or $8 million. DOE's part of the effort *(continued on page 4)*

Other Program Items

Consultation and Cooperation Activities

Under Section 117(c) of the NWPA, DOE is required to enter into agreements and begin negotiations with affected States or Indian Tribes no later than 60 days after Presidential approval of three sites selected for characterization, or at the request of the State or Indian Tribe, whichever occurs first.

At the request of the State of Washington and the Yakima and Umatilla Tribes, DOE had already begun Consultation and Cooperation (C&C) negotiations with these affected parties. On July 25, 1986, letters of invitation to either begin or resume the negotiation process were sent to the States and Indian Tribes.

The terms of C&C agreements will vary, depending on the specific needs and interests of the particular State or affected Indian Tribe. No two agreements are likely to be identical, but DOE will seek agreements that specify procedures to carry out the 11 provisions of Section 117(c). ☆

National Academy of Sciences Agrees to Provide Assistance to OCRWM for Site Characterization

Ben C. Rusche, Director of OCRWM, has requested the NAS to continue its interactions with OCRWM on geologic repositories.

In a letter dated July 25, 1986, to Frank Press, President of the NAS, Mr. Rusche wrote, "Preliminary discussions with Board members and staff have identified significant benefits of continued Board (on Radioactive Waste Management) oversight of activities during the next important site characterization phase in the repository program. They have also identified the desirability to have the Board and the Academy review the proper scope and content of future Board involvement with particular emphasis given to site-specific and comparative evaluations through the establishment of suitably constituted panels of the Board...Given current activities such as the development of site characterization plans and implementation of the quality assurance program, timely Board participation will be of substantial value."

In his reply, Dr. Press noted that interactions in the site characterization phase of the OCRWM repository program are "important national issues of just the sort that the Research Council (the Board's parent organization) was established to consider...The National Research Council can and will provide the advice you seek." ☆

Report On Quarterly Meeting With First Repository States and Affected Indian Tribes

The Quarterly Meeting of States and Affected Indian Tribes took place in Portland, Oregon, on August 13, 1986. Russell Jim of the Yakima Indian Nation served as chairperson.

Topics discussed at the meeting included: advance notice of the release of the Environmental Assessments and the first repository nomination and recommendation decision; clarification of financial assistance guidelines; allocation of defense waste costs; the status of the LSS (see page 2); the status of site characterization; quality assurance; and an OCRWM program update, including the use of the National Academy of Sciences (NAS) for oversight in some of the site characterization work (see page 4), and technical and development studies relating to a second repository.

A group of State, Tribal, and DOE representatives was established to work together to develop a model for more effective quarterly meetings. The State of Washington volunteered to be the site for the next meeting in the fall of 1986. ☆

OCRWM Personnel Announcements

Office of Geologic Repositories

William J. Purcell, who has headed the technical program for identifying candidates for the Nation's first geologic repository for high-level radioactive waste, is retiring effective September 19, 1986. Mr. Purcell will continue to be available to participate in OCRWM activities through a consultant appointment.

Mr. Stephen H. Kale is being appointed Associate Director, Office of Geologic Repositories. He succeeds William J. Purcell. Stephen Kale comes to OCRWM with 25 years of experience in the nuclear energy industry and project management.

Currently, Mr. Kale is a Project Manager with Energy Impact Associates, with responsibilities for development of computer programs for the New York Power Authority. Prior to this position, Mr. Kale held posts of increasing responsibility with

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Personnel Announcements
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coordination of Westinghouse engineering and licensing activities, as well as the delivery and installation of nuclear equipment in the United States and four foreign countries. In addition, Mr. Kale served for many years on the Westinghouse Safety Review Committee.

Mr. Kale received his B.S. degree in Mechanical Engineering from the University of Michigan. He also attended the U.S. Naval Officer Engineering School. ☆

Tom Isaacs, who has served as Director of the Repository Coordination Division in the Office of Geologic Repositories since August 1985, will assume the position of Deputy Associate Director, Office of Geologic Repositories, immediately. He will continue as Division Director in an acting capacity until a replacement is named. ☆

Office of Policy and Outreach

Jerome Saltzman is the new Deputy Director of the Office of Policy and Outreach, replacing Robert Purple, who recently retired.

Mr. Saltzman comes to OCRWM with 25 years of experience in nuclear energy programs. Most recently, he was Assistant Director for State and Licensee Relations in the Office of State Programs for the NRC.

He holds a Master's Degree in International Relations from the University of Wyoming, and a Bachelor's Degree in Government from the City College of New York. ☆

Virginia Power
(continued from page 2)

was conducted at the DOE laboratories in Richland, Washington, and Idaho Falls, Idaho, and consisted of the establishment of the technical basis for storing spent fuel in dry casks and the conduct of dry cask storage tests at DOE test facilities.

The financial and technical encouragement of EPRI, and the expeditious review, evaluation, and processing by the NRC, have been instrumental in this successful pooling of efforts to achieve a common national goal. As a result of this achievement, spent fuel from commercial power reactors can now be stored at reactor sites in a safe, economical, and environmentally acceptable manner both in pools and in dry casks while the waste system leading to permanent disposal in geologic repositories is being developed. ☆

Selected Events Calendar

September 23	Western Legislative Conference, Subcommittee on Environment and Hazardous Materials, Colorado Springs, CO. Contact Peggy Spangler (415) 986-3760.
October 19-22	Atomic Industrial Forum Meeting on High-Level Waste Business—Transportation, Storage, and Disposal, Charleston, SC. Contact Patrice Boulanger (301) 654-9260.
October 23-24	Quality Assurance Coordinating Group Meeting, Columbus, OH. Contact Carl Newton (202) 252-9300.
November 16-18	National Conference of State Legislatures, Hazardous Waste Seminar, Chicago, IL. Contact Paul Doyle (303) 623-7800.
November 18	Transportation Coordination Group Meeting, Columbus, OH. Contact Robert Philpott (202) 252-9620.
January 21-22, 1987	Quality Assurance Coordinating Group Meeting, Albuquerque, NM. Contact Carl Newton (202) 252-9300.

For details on DOE/NRC meetings, call 1-800-368-2235 for a recorded message. In Washington, D.C., call 479-0487.

A telephone recording service has been established for the announcement of upcoming meetings related to the waste management program of the NRC. The number is 1-800-368-5642, ext. 79002. Washington, D.C., residents should call 427-9002.

For information on meetings and events occurring between issues of the OCRWM *Bulletin*, use OCRWM INFOLINK, an Electronic Bulletin Board that can be accessed through a standard computer communications capability on (202) 252-9359, or call Tim Conner (202) 252-6356. The OCRWM *Bulletin* is now available through INFOLINK.

New Publications and Documents

"Transportation Institutional Plan" DOE/RW-0094
August 1986

The plan contains background information and discusses principles and policies for establishing a transportation system for high-level radioactive waste. Also, it identifies the major participants and mechanisms for resolution of issues related to the operation of the transportation system. For copies, contact the U.S. Department of Energy, Office of Public Affairs, Room 1E206, 1000 Independence Avenue, SW, Washington, D.C. 20585, or call (202) 252-5575.

"Request for Proposal—Transportation Operations Management Configuration Study" DE-AC05-87-OR21666
August 1986

The objective of this Request for Proposal is to gather data to support analysis of various options for managing and operating the OCRWM transportation system. For copies, contact the U.S. Department of Energy, Oak Ridge Operations Office, Post Office Box E, Oak Ridge, TN 37831, Attention: Robert French, or call (615) 576-4879.

"OCRWM Backgrounder—Activities During the Site Characterization Phase of the Geologic Repository Program" DOE/RW-0098
September 1986

This document provides background on site characterization, an overview, and details on the exploratory shafts, site characterization plans, and environmental and socioeconomic studies.

"OCRWM Backgrounder—Cooperative Demonstration Projects for Spent Nuclear Fuel" DOE/RW-0099
September 1986

A description of current methods for storage of spent nuclear fuel, and cooperative demonstration projects, including rod consolidation and dry storage.

"OCRWM Backgrounder—Studies of Alternative Methods of Radioactive Waste Disposal" DOE/RW-0100
September 1986

Prior to the passage of the NWPA, nuclear waste disposal alternatives to deep-mined geologic repositories were evaluated. These disposal alternatives included subseabed, emplacement in a very deep hole, rock melt, island-based geologic, ice-sheet, deep-well injection, and space, as well as transmutation waste form treatment, and indefinite surface storage. This backgrounder provides an overview of these nuclear waste disposal alternatives.

Currently Scheduled OCRWM Short-Term Program Milestones

Issue *Federal Register* Notice on defense waste fee

Issue announcement of Licensing Support System design and implementation procurement to Commerce Business Daily

Perform annual OCRWM Quality Assurance Assessment

Issue OCRWM Safety Plan

Issue annual update of Spent Fuel Storage Requirements Report

Plan Issued

(continued from page 1)

The "Transportation Institutional Plan" will be combined with the "Transportation Business Plan" (DOE/RW-0046, January 1986) to provide guidance in the integrated development of a network of program participants and the acquisition of the hardware and procedures to support shipping under the provisions of the Nuclear Waste Policy Act of 1982 (NWPA). Before the system begins operation, a third plan element will be required to delineate operational contacts, requirements, and procedures. It is currently projected that in 1987, the U.S. Department of Energy (DOE) will issue, in draft, an early form of a comprehensive transportation plan that will combine the institutional and business elements and provide a framework for an operational element (see new publications section). ☆