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U.S. Nuclear Regulatory Commission
before the
Subcommittee on Oceanography of
the House Committee on Merchant Marine and Fisheries
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Mr. Chairman, I am pleased to be here today to discuss with the Subcommittee the disposal of radioactive materials into or under the sea. Because of past U.S. policies to restrict such activity, this is an area of nuclear waste disposal with which the NRC has had little involvement since its formation in 1975. However, I can provide you with an overview of the NRC regulatory authority, the history of AEC policies which lead to those of the NRC, and a summary of the few ongoing NRC activities with direct bearing on the subject of disposal of radioactive materials at sea.

NRC AUTHORITY

NRC authority to regulate possession and disposal of radioactive waste is derived from three acts: the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974, as amended, and the National Environmental Policy Act of 1969. The Act of 1954 gave the Atomic

Energy Commission (AEC) authority to license and regulate possession, use and disposal by persons* of source, byproduct, and special nuclear material. The AEC and its prime contractors were exempt from licensing control.

Title II of the Energy Reorganization Act of 1974 transferred the regulatory authority given in the Atomic Energy Act to the Nuclear Regulatory Commission. ERDA (now part of DOE) and its prime contractors remained exempt from NRC regulatory authority except as provided in Section 202 of the 1974 Act. Section 202 of the 1974 Act gives NRC specific authority to license certain DOE waste management activities for storage and disposal of high level radioactive wastes:**

Section 202(3) provides for licensing of "Facilities used primarily for the receipt or storage of high-level radioactive wastes resulting from licensed activities." Thus the NRC must license a DOE storage or disposal facility which is used primarily to receive high-level

*Persons are any individuals, firms, or agencies (with exception of NRC and DOE).

**High-level liquid waste has a specific meaning within current NRC regulations. It is defined in Title 10, Code of Federal Regulations, Part 50, Appendix F, as follows: "High-level liquid radioactive wastes mean those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent...in a facility for reprocessing radiated reactor fuels."

radioactive waste from industrial producers of that waste (i.e., reactors, reprocessing plants, etc.).

Section 202(4) provides for licensing of "Retrievable Surface Storage Facilities and other facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the Administration which are not used for, or are part of, research and development activities." Thus with the exception of research and development activities NRC must license DOE operations for the long-term storage (or disposal) of high-level wastes generated by DOE.

Under Section 274 of the 1954 Act NRC may relinquish to the states certain regulatory authority over byproduct, source, and special nuclear materials in quantities not sufficient to form a critical mass. The discontinuance of NRC authority is accomplished by entering into formal agreements with the states. There are currently 25 such Agreement States. Under the agreement and pursuant to 10 CFR Part 150, these Agreement States license commercial burial sites for low-level waste including low-level transuranic waste.* Regulatory authority over sea disposal of these wastes is retained in the NRC.

*Transuranic nuclides are nuclides with atomic numbers above that of uranium (i.e., 92). These nuclides are produced in the fuel elements during operation of a nuclear reactor. Most are long-lived and highly radiotoxic. For example, plutonium-239, which has a half-life of 24,000 years is a transuranic nuclide.

NRC regulatory authority over radioactive waste is defined by statutes which specify who and what is to be regulated. Insofar as DOE activities are concerned, it is not based primarily on the degree of hazard posed by the waste, the lifetime of the waste, or the waste form.

HISTORY OF U.S. AND NRC POLICY REGARDING DISPOSAL OF
RADIOACTIVE MATERIALS AT SEA

I am submitting, for the record, a brief history of U.S. waste management policy. In relative terms, few resources and little effort have gone into development of regulations or research regarding disposal of radioactive materials at sea in recent years.

During the early decades of the U.S. nuclear development, disposal at sea of low level radioactive wastes was permitted under license by the USAEC. Between 1946 and 1970 the former U.S. AEC licensed the dumping of more than 86,000 containers of low level radioactive wastes into the Atlantic and Pacific Oceans. In June 1960 the Commission ~~placed a~~ discontinued issuance of new licenses for sea disposal. Existing licenses authorizing sea disposal were permitted to remain in effect and licensees were permitted to continue waste disposal operations at sea. Early in 1960 the AEC also authorized licensees to use, on an interim basis, AEC land burial sites in Idaho Falls, Idaho and Oak Ridge, Tennessee. In September 1962 the first commercial land burial facility,

located in Nevada, was licensed and became available for use by private organizations. Shortly thereafter, the AEC withdrew the use of the land burial sites at National Laboratories by licensees. Since that time, licensed commercial land burial facilities have been established in the States of Kentucky, New York, Washington, Illinois, and South Carolina.

There has been very little interest in sea disposal in the last few years due primarily to the availability of land burial sites. At the time the AEC stopped issuing new licenses became effective, there were seven commercial firms licensed by the AEC to collect radioactive waste from other persons and to dispose of the waste at sea. In addition, there were eight organizations licensed by the AEC to dispose of waste generated in their own laboratories. Since 1965, less than 200 curies of radioactive waste have been disposed of at sea. The last disposal at sea under an AEC license was made in June 1970. At this time, no NRC licenses exist which allow ocean dumping of radioactive wastes.

In December 1971 the USAEC published an amendment to its regulations (10 CFR Part 20) directed at ocean dumping of radioactive wastes. The exact words of 10 CFR Part 20.302(c) are:

"The Commission will not approve any application for a license for disposal of licensed material at sea unless the applicant shows that sea disposal offers less harm to man or the environment than other practical alternative methods of disposal."

The adoption of this rule did not mean that the Commission considered sea disposal of radioactive waste an unsafe practice. Rather, it imposes on licensee operations a policy which already existed for the AEC's own operations. No licenses have been granted for sea disposal under these provisions of the regulations. Further the rule is consistent with the CEQ's recommendations of October 1970 to establish a "comprehensive national policy on ocean dumping to...strictly limit ocean disposal of any materials harmful to the marine environment."

Thus over a period of approximately a decade, dumping of radioactive waste at sea has been phased out as a waste disposal system, although sea disposal is not precluded by regulation. This shift in disposal methods was driven by (1) international objection to sea disposal on environmental grounds, (2) a change in AEC disposal philosophy to contain wastes (as in land burial) rather than disperse wastes (as in sea dumping), and (3) because land burial was more economically attractive to the commercial industry.

In 1972 the AEC/CEQ philosophy was further codified by the Congress in the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA). Under the provisions of that act, dumping of nuclear wastes in the ocean, where such acts are subject to U.S. jurisdiction, requires a permit

issued by EPA. Permits may only be issued in the light of criteria defined by statute. MPRSA gives the NRC no formal regulatory role except to the extent that EPA may be required to consult under the following clauses:

"in establishing or revising such criteria, the Administrator shall consult with Federal, State, and local officials, and interested members of the general public, as may appear appropriate to the Administrator.

In reviewing applications for permits, the Administrator shall make such provision for consultation with interested Federal and State agencies as he deems useful or necessary."*

Ocean dumping activities regulated under the Act** are not subject to NRC regulation, in view of the fact that "licenses...other than those issued (by EPA)...shall be void and of no legal effect, to the extent that they purport to authorize any activity regulated by (MPRSA)." It appears that NRC would nonetheless become involved because no one would be authorized to receive radioactive material to dump at sea except under an NRC license. That is, while NRC would not license the act of dumping, the Atomic Energy Act of 1954

*EPA's regulations do not provide, however, for consultation with NRC. See 40 CFR § 222.3.

**Such activities presumably include disposal of high-level radioactive waste (including spent fuel), even though the Act expressly prohibits issuance of permits in relation to such material.

requires all persons to have a license for the possession and use of such material. Although it appears that seabed disposal would come under the provisions of MPRSA, it is a concept not envisaged in 1972.

Finally, the restrictions of MPRSA apply only to "dumping," which by definition excludes "a disposition of any effluent from any outfall structure to the extent that such disposition is regulated under...the provisions of the Atomic Energy Act of 1954." That is, small normal effluents into the ocean are licensed by the NRC and kept as low as reasonably achievable.

HISTORY OF INTERNATIONAL ACTIVITIES

Although no ocean disposal of low-level radioactive wastes is allowed by the U.S., several European nations dispose of low-level radwastes in the Atlantic Ocean within the framework of the Nuclear Energy Agency (NEA) of the Organization for Economic Co-Operation and Development (OECD). The NEA requires prior notification and consultation between NEA member nations as well as supervision of the disposal operation by representatives nominated by the NEA.

Since 1967 the NEA has supervised the dumping of some 290,000 curies of solidified low-level radioactive wastes (packaged in 55 gallon drums) from eight European countries in a deep dump site near the Iberian Abyssal Plain in the Northeast Atlantic.

An OECD press release of July 1977 gives a concise picture of the NEA/OECD program. I have a copy which I can submit for the record.

An international agreement on ocean dumping was reached in December 1972, resulting in the London Convention on the Prevention of Marine Pollution by Dumping Wastes and Other Matter. The Convention has been ratified by thirty-five countries. It prohibits the dumping of high-level wastes or other high-level radioactive matter defined by the IAEA as unsuitable for dumping at sea and requires a special permit for the dumping of other than high-level radioactive wastes.

The IAEA recently revised its Provisional Definition and Recommendations Concerning Radioactive Wastes and Other Radioactive Matter and will submit the revision to the Third Consultative Meeting of the Contracting Parties in September 1978. The recommended definition is based on immediate release and dispersion of the material.* The U.S. is reviewing analyses used to derive the definition. The results may be unnecessarily

*The disposal philosophy being developed within the agencies in the U.S. (mainly the EPA and NRC) is to contain rather than disperse the wastes. Early U.S. dumping operations were based on the dispersal philosophy; the philosophy still followed by many European countries remains one of dilution and dispersion. In the current U.S. approach, the ocean becomes merely a final containment barrier between the wastes and mankind in the event that the containment fails in some of the containers.

conservative in that they take no credit for containers. Such an approach means that improvements in containers are unlikely to be applied in practice. The Department of State and EPA have the lead for U.S. involvement in this activity. NRC participates in interagency meetings and provides technical input.

NRC PROGRAMS

In April of 1975 NRC created a functional unit in the Division of Fuel Cycle and Material Safety (Office of Nuclear Materials Safety and Safeguards) with the title and mission of Waste Management. This program has grown from essentially no resources at the time of its formation to nearly forty staff and five million dollars of contractual support (FY79 Presidential Budget). It is aimed at developing and implementing a regulatory program governing the storage and disposal of nuclear wastes. Because of existing policies, only a small portion of that effort has direct bearing on disposal into the sea (or the seabed).

The NRC program for low-level waste is described in NUREG-0240, "The Nuclear Regulatory Commission Low-Level Radioactive Waste Management Program" which I can submit for the record along with NUREG-0217 which describes in detail the history of disposal of low-level waste by shallow land burial and discusses future regulatory options.

One of the elements of the NRC low-level waste program which was just recently begun is a study of alternatives to shallow-land burial for the disposal of low-level radioactive wastes. That study will investigate ocean dumping with respect to environmental effects, technical aspects, social and political implications, and economics. If ocean dumping is found to have several significant advantages over shallow land burial and other alternatives, it is expected that a study may be funded to develop criteria for waste performance and site suitability and to identify potential environmental impacts.

Because there will always be a limited number of alternatives for the disposal of wastes (deep-geologic, shallow land burial, and ocean dumping are the only ones now practiced or under serious consideration) we feel that an important part of our program is the development of a classification system for radioactive wastes which will allow us to decide where each waste may be sent for disposal. The first phase of our work is nearing completion, and reports are almost ready which will lay out in some detail the principles of waste classification and the methodology to implement those principles.

The effort thus far has been directed mainly at deep geologic disposal and shallow land burial. In the second phase of the program, we are considering applying the principles to ocean dumping to see what wastes

in what sort of packages might be consistent with the principles we have derived. Classification for ocean disposal would need to consider the ground disposal alternatives and vice versa. For example the determination of whether a given transuranic waste should go to deep geologic disposal, shallow land burial or be dumped in the ocean would be based on the consideration of potential exposures to individuals and populations, dose commitments and economic impacts. Note that the definitions could vary from country to country since the alternatives and costs vary from country to country.

In the area of seabed disposal (actual emplacement of wastes within the deep-sea sediments) the NRC staff has done little more than follow closely the progress of the DOE program and the international program under the NEA. In that regard, we can say that seabed disposal of concentrated (high level) radioactive wastes has some conceptual advantages and maybe even some safety advantages. However, the amassed knowledge regarding the option is not sufficient to draw definitive conclusions. It is certainly a disposal concept which deserves continued study and development--perhaps for the second or third generation of disposal sites.

From a regulatory viewpoint, seabed disposal may offer one singular advantage. The seabed geologic regime is one of the simplest on the

planet. There is vast horizontal uniformity, there are no hydraulic gradients to drive nuclides out of the sediments, the sediments themselves are uniform and highly retentive, and the known geologic processes are all very slow and depositional rather than erosional. Apparently nothing has changed on portions of the seafloor for fifty million years. The NRC staff is considering the development of a risk assessment capability for seabed disposal. This could bring important contributions to our understanding of the more complex land-based geologies, and we could provide better information to the DOE program regarding which geologic parameters are important in seabed disposal.

THE NUCLEAR NON-PROLIFERATION ACT OF 1978

You asked that we briefly discuss the implications of the Nuclear Non-Proliferation Act of 1978 on sea disposal. One purpose of the Nuclear Non-Proliferation Act of 1978 is to provide for effective international control over the proliferation of nuclear explosive capabilities. The Act does not directly address the manner in which nations importing nuclear materials and technology from the U.S. will dispose of nuclear wastes. The Act does, however, encourage international undertakings providing for spent fuel storage. It also instructs the President to endeavor to provide for cooperation between the U.S. and importing countries in protecting the international environment from radioactive, chemical, or thermal contamination from peaceful nuclear activities, which would include waste disposal.

Moreover, one of the export licensing criteria of the Act (set forth in Section 305) provides that no source or special nuclear material proposed to be exported from the U.S. or produced through the use of U.S. exported material will be reprocessed and no irradiated fuel elements shall be altered in form or content without prior approval of the U.S. Thus, the U.S. will be making determinations which may impact on certain waste management or disposal strategies in importing countries although the basis for making such determinations will relate solely to non-proliferation concerns.

Conclusion

In brief, although ocean dumping of radioactive wastes is not prohibited under NRC regulations and the Commission has not made any finding that ocean dumping is unsafe no such sea dumping has taken place since 1970. Seabed disposal is an intriguing concept, still in the research phase, and this research should be carried forward at least until we have a bit more knowledge.

The ocean is a resource whose potential is not fully realized. Care must be taken in any plans for sea disposal to avoid preventing the use of potential resources by future generations.

We would favor a somewhat different regulatory scheme than presently exists: that EPA set generally applicable environmental criteria for all forms of ocean disposal as they will for land disposal; NRC should then develop the regulatory framework and licensing procedures to ensure that the environmental criteria set by EPA are satisfied. When it appears that license applications for ocean disposal might be forthcoming, the NRC should develop the necessary regulatory and licensing base for its part of the regulatory responsibilities. Legislation would however ultimately be required.