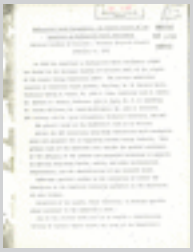

Radioactive Waste Management: An Interim Report of the Committee on Radioactive Waste Management

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National Academy of Sciences - National Research Council

February 17, 1970

In 1968 the Committee on Radioactive Waste Management (CRWM) was formed by the National Academy of Sciences (NAS) at the request of the Atomic Energy Commission (AEC). The present membership consists of Professor Clark Goodman, Chairman; Mr. W. Kenneth Davis; Professor Robley D. Evans; Dr. John C. Frye; Professor Jack E. McKee; Mr. Herbert M. Parker; Professor John H. Rust; Dr. F. H. Spedding; Dr. Clarke Williams; Mr. Hood Worthington; Mr. John A. Erlewine, AEC Liaison; and Dr. Cyrus Klingsberg, Technical Secretary, NAS-NRC.

The general scope of the Committee's task is as follows:

Advise the AEC concerning long-range radioactive waste management plans and programs for an expanding nuclear energy industry. This primary task of the Committee will include the general assessment of the adequacy of the present and projected technology in relation to meeting long-range health, safety, and other environmental requirements, and the identification of new research needs.

Undertake specific studies on the initiative of either the Commission or the Committee following agreement on the objectives of such studies.

Establish ad hoc panels, where necessary, to develop specific areas essential to the Committee's work.

One of the initial tasks will be to compile a comprehensive listing of various topics within the scope of the Committee's

charter that could be considered by the NAS and the AEC as additional tasks for study by the Committee.

The Committee will not be requested to provide advice on specific cases that normally come within the purview of the AEC Advisory Committee on Reactor Safeguards.

The general scope of the Committee's task may be modified or extended as needed by mutual consent of the Atomic Energy Commission and the National Academy of Sciences.

The Committee on Radioactive Waste Management spent its first year visiting the major AEC sites to survey the present and anticipated practices involved in radioactive waste management. The Committee has been particularly attentive to the problems associated with the permanent storage of high-level radioactive wastes from nuclear fuel reprocessing plants.

Following its organizational meeting in Washington, D.C., on August 26, 1968, the CRWM held its first on-site visit at Oak Ridge National Laboratory (ORNL) on October 17-18, 1968. The pattern established here was followed at all future site visits. After formal presentations, which covered all aspects of that site's waste management programs, both operational and R&D, the Committee made a tour and saw firsthand the practices described in the presentations.

The topics covered at Oak Ridge included the following:

1. Low-, intermediate-, and high-level waste management,
2. Storage of high-level solidified waste in salt formations,

5. Economic evaluations of fuel reprocessing waste management,

6. Siting fuel processing plants and waste management facilities,

7. Management of solid, gaseous, and liquid wastes,

8. Hydraulic fracturing, including rock mechanic aspects,

9. Environmental monitoring and radioecological research relevant to radioactive waste releases, and

10. A survey of the geohydrological characteristics of the ORNL site.

For the site tour, four ORNL locations were visited. The first was the central control room for the gas and liquid monitoring equipment where both monitoring and recording are continuous. The second building contained evaporator and waste condenser controls that are responsible for monitoring 99 percent of all ORNL waste. At the third location the Committee visited a modified water treatment plant, which used lime, soda ash, and clay to decontaminate the radioactive liquids. At the final stop, the hydrofracturing station was visited. It was not in operation at the time, since there are only two injections a year, each lasting about one day.

The third meeting of the Committee was held at the Savannah River Plant (SRP) on January 20-21, 1969.

Representatives of Du Pont (which is responsible for the overall management of the SRP) reported that Du Pont, in addition to cooperating with local boards of health and the U.S. Public Health Service, has supported an independent study by the Academy of Natural Sciences of [redacted]

plant went into operation. It still conducts periodic surveys, and the results of these indicate that the operation of the SRP has had very little effect on the biological condition of the Savannah River.

Additional formal presentations included such topics as

1. Long-term storage of highly active wastes in bedrock caverns,

2. Design and construction criteria for facilities to handle highly active liquid waste,

3. The handling and storage of separations process wastes,

4. Disposal of radioactively contaminated solids,

5. Disposal of contaminated water from the reactor areas,

6. Control guides and experience related to radioactivity release to the environs, and

7. Geology, hydrology, and geography of the site.

For its plant tour, the Committee observed a power boat collecting water samples from the Savannah River and a continuous floating sampler. An empty emergency holding basin (for reactor cooling water) of 50-million-gallon capacity was visited. The chemical processing plant was seen from the road but was not entered. The Committee saw completely buried, high-level storage tanks of 85-foot diameter and, nearby, four tanks, each of 1-1/4 million-gallon capacity, were observed under construction. The Committee entered a small monitoring building filled with waste-tank cooling coils in which the decay heat could be felt in some of the pipes. A drop in temperature observed at this location would allow the point of a leak in a tank's cooling coils to be located. A newly prepared burial ground was observed where

containers of contaminated solids and empty contaminated water tanks from a Greenland airplane crash were being buried.

Prior to the fourth meeting of the Committee, a task force consisting of Goodman, Rust, and Klingsberg visited the Dresden Nuclear Power Station, Morris, Illinois, on April 16, 1969. Between 2 and 3 thousand cubic feet of solid low-level wastes will be handled there annually. The Sheffield Burial Site is approximately 50 miles to the west; it is managed by the Nuclear Engineering Corporation on ground that is owned by the state of Illinois.

On a site adjacent to the Dresden plant a fuel reprocessing plant is being built by General Electric (G.E.). This 300-ton-per-year plant is known as the Midwest Fuel Recovery Plant (MFRP).

In addition, Commonwealth Edison is constructing two additional large boiling water nuclear power plants, known as Dresden No. 2 and Dresden No. 3, which will be in operation in the very near future. The question of what level of stack discharge of radioactive gases will be permitted from each of the three Dresden plants plus the G.E. reprocessing plant is now being considered by the AEC Licensing and Regulations Division.

For its fourth meeting, the Committee visited the National Reactor Testing Station (NRTS), Idaho Falls, Idaho, April 17-18, 1969. The formal presentations included such topics as:

1. Radioactive waste management policy at NRTS,

2. Waste generation and management at test reactors, at the chemical processing plant, and at the Experimental Breeder Reactor II (EBR-II) project,

3. Solid waste disposal,

4. Calcination of liquid waste,

5. Management of radioactive waste proposed for the loss of fluid test (LOFT),

6. Radionuclide distribution in regional groundwater and in the regolith as a result of liquid waste disposal,

7. Environmental behavior of gaseous waste disposal in the atmosphere including prediction of trajectories and dispersion, and,

8. Geology and hydrology of the NRTS site.

For its plant tour, the Committee visited the Fuel Cycle Operations of EBR-II. A demonstration was held of a dump of a "cold" can into a burial hole at the EBR-II burial grounds. The Idaho Chemical Processing Plant was visited. This is a canyon building with a 240-foot operating corridor. The plant was not in operation at the time. Finally, the Committee visited the calciner, which employs a fluidized bed at 400°C.

The fifth meeting of the Committee was held at the Hanford Plant, Richland, Washington, June 23-24, 1969. The lectures included—

1. Hanford waste management policy covering the nature, present handling, and storage of chemical processing wastes and future options in long-term waste storage,

2. Handling of contaminated gaseous, solid, and liquid effluents in chemical processing plants,

3. Fuels and reactor waste disposal practices,

4. Waste solidification demonstration program (phosphate glass, spray solidification, pot calcination),

5. Movements of radionuclides through the local environment, and

6. General site description.

For the plant tour the Committee visited B Plant and saw a demonstration that is typical of a remotely operated and remotely maintained plant. The Committee visited a display of off-site shipping containers: a HAPO-II shipping container and its protective buffer container, small tunafish-type cans, birdcage containers, and 5-inch diameter plastic bottles. The Purex separation plant was visited next, and the Committee walked through the pipe and operating gallery. Two 1-million-gallon tanks of the SRP type were observed under construction. An exploratory well, 3100 feet in depth (which will be extended to 7500 feet when completed), was observed. At the Chemical and Materials Engineering Laboratory the Committee visited the fission product cask handling area. A 30-ton loading cask was observed through a shielded window. In addition, a 350-gallon on-site cask was observed close up.

Following these plant visits the Committee met with the AEC Commissioners in Germantown, Maryland, on October 9, 1969, in order to inform the AEC of the progress to date.

The seventh meeting of the Committee was held at the Atomic Industrial Forum, New York, on September 12, 1969. An ad hoc group of industrial representatives presented their points of view with respect to the problems of radioactive waste management.

The purpose of the tour of the major AEC installations was to provide an appropriate orientation for the Committee so that it would

be brought up-to-date as to the current research and development programs under way at these AEC sites.

The Committee noted the extensiveness and care in waste management at each site visited. The Committee is gratified by the quality and scope of the R&D program sponsored by the AEC in radioactive waste management.

[redacted]

2. Management of low-level wastes,

3. Review of cost evaluations of radioactive waste management,

4. Analysis of AEC policy on high-level waste management, and

5. Exchange of information between the United States and other countries.

In all of these studies, an attempt will be made to maintain a balanced viewpoint between radioactive wastes and all other types that could endanger the environment.