

A continuing research and development program is being supported by the AEC to assure that the engineering technology is adequate to satisfy the needs of the cask designer. A shipping cask design code is presently being developed for the use of the industry at the Oak Ridge National Laboratory (ORNL) in Tennessee. Other research is underway to develop a substitute for lead as the primary shielding material in large shipping casks because of its relatively low melting point. Future R&D is anticipated in the area of fast breeder reactor fuel shipping, as an integral part of the Commission's Fast Breeder Reactor Development program.

LONG-TERM SAFETY OF HIGH ACTIVITY WASTE STORAGE

More than 20 years' experience with the storage of liquid high-activity wastes in specially designed underground tanks have shown it to be a safe practical means of interim handling, but the long-term usefulness of this method may be limited. Assessments have been made which indicate that large releases of radioactivity due to geologic and hydrologic events are only remotely possible in the areas where high-activity wastes are stored. These studies have included an evaluation of the historic record of seismicity and the longer-ranging geologic record, including investigation of geologic structure; physical and hydrologic properties of sediments and rocks; and analysis of terrains in the vicinity of high level waste management operations. Studies of extremely unlikely hydrologic events are being continued in a further effort to specify their probability of occurrence and potential effects on nuclear facilities and associated waste management systems.

Due to the inherent restrictions of tank storage, such as potential leakage and the necessity of liquid waste transfer for periods of hundreds of years, the Commission has supported an extensive research and development program directed at engineering practical systems for conversion of high activity liquid waste to a solid form. Concurrently, extensive studies have been carried out to determine the most suitable geologic formations for the long term storage of highly radioactive waste material. Salt is an advantageous disposal media because of its unique geologic characteristics. Salt formations are dry and impervious to water. They are not associated with usable ground water sources and, therefore, have no connection or contact with the biosphere. Because of its plasticity, fractures in salt seal or close rapidly. Deposits of rock salt underly some 400,000 square miles of the United States and represent some of the few naturally occurring dry environments in the eastern part of the country where the most extensive development of the nuclear industry is taking place. Extensive laboratory investigations at ORNL and field studies in the Carey Salt Mine, Lyons, Kansas, are providing field data and design information required for the engineering design of a long term disposal facility for high activity waste solids.

A field experiment called Project Salt Vault, has been carried out in which Engineering Test Reactor fuel elements of high-radioactivity were used to simulate the thermal and radiation characteristics of full-scale power reactor fuel reprocessing wastes, such as would exist in a pot containing calcined solids. The field demonstration began in November 1965—four successful changes of fuel elements were completed in June 1967. The experimental results from Project Salt Vault are now being evaluated and appear most encouraging. The feasibility and safety of handling highly radioactive materials in an underground environment has been demonstrated, and the stability of salt under the effects of heat and radiation has been shown. Engineering reports of this work will be available to industry during this year and the various factors involved in establishing a prototype salt disposal facility for the storage of high activity waste solids is now under study at ORNL. The use of other geologic materials for long term storage, such as crystalline bedrock, thick anhydrite, or limestone beds is also under study.

WASTE MANAGEMENT RESEARCH

The management of radioactive waste materials in a growing atomic energy industry can be classified under two general categories. These are the treatment and disposal of large volumes of low activity gaseous, liquid, or solid wastes which are evolved during the course of operating reactors and other nuclear facilities; and the treatment and ultimate disposal of much smaller volumes of high activity wastes generated during the reprocessing of irradiated nuclear fuels. Significant progress and accomplishments have been achieved during the