Nuclear Information & Resource Service
1424 16th St. NW Suite 404 Washington, DC 20036 202-328-0002 fax 202-462-2183
http://www.nirs. org

NIRS

ENERGY FACT SHEET

WHY IS GROUNDWATER TRAVEL TIME IMPORTANT IN NUCLEAR WASTE REPOSITORY SITING?

The primary means by which radionuclides could escape a geologic repository is in solution or suspension in moving groundwater. The more rapidly water moves through the underground waste emplacement area, the greater will be the volume of water in contact with the waste, and the greater will be the amount of waste removed from the emplacement area in any given period of time.

The goal of geologic isolation of the highly radioactive waste is to contain the waste at the location in which it was emplaced. In reality, during the thousands to millions of years that some of the radionuclides remain hazardous, it must be expected that some fraction of the waste will be contacted by moving underground water and travel with that water to the accessible environment. The accessible environment is the ground, the water, and the air that is available for human contact beyond the repository area where human access is controlled.

Rapid groundwater travel time from the proposed waste emplacement area to the accessible environment is a natural characteristic of a site that would indicate the potential for a large amount of radionuclides to be to be released from the repository over a short period of time, and be moved quickly to a location away from the repository where it would be available for human contact. This would be in direct contradiction to the goal of geologic waste isolation, and therefore would be grounds to eliminate the site from further consideration for development of a repository.

Rapid groundwater movement through the waste to the accessible environment also promotes dilution of the contaminants in the receiving water, a concept that is in direct conflict with the goal of preventing pollution of underground and surface waters, and the air.

HOW WOULD A YUCCA MOUNTAIN REPOSITORY CONTAMINATE THE LOCAL WATER SUPPLY?

Groundwater that travels beneath Yucca Mountain flows south to Amargosa Valley, becoming part of the water supply aquifer beneath the valley floor. The water is pumped from wells and used for domestic drinking water, livestock water, and crop irrigation. The water eventually surfaces in the base of the enclosed basin, at Franklin Lake Playa, and in springs in Death Valley.

The current concept of a Yucca Mountain repository is that precipitation on the ground surface infiltrates

downward through fractures in the rock, passes through the waste emplacement level, and joins the groundwater at the water table beneath the repository.

The emplaced waste would be sealed in corrosion resistant containers to delay infiltrating water contacting the radioactive materials. But, eventually the containers will corrode and downward infiltrating water will contact the waste and begin transporting it in solution and suspension to the water table. On arrival at the water table the waste will mix in the groundwater while being transported toward and into the water supply aquifer beneath the valley. Contamination of the aquifer is part of the repository plan.

The concentration of the radioactive contaminants at a given time in the water supply depends upon a number of factors. Climate conditions control the amount of infiltration, which is a key factor in radionuclide transport from the repository. The current precipitation rate at Yucca Mountain is at an extreme low when compared to the past few hundred thousand years, and knowledge of climate cycles suggests that average precipitation will increase in the future, just as it has a number of times in the past.

The rate at which containers corrode and expose radionuclides to infiltrating water is also a function of the infiltration rate and how much water actually contacts the containers. The longer the containers remain intact, the more radionuclides will decay, thus reducing the total waste available for transport to the aquifer. But then the flow rate of water contacting the waste will affect the contaminant concentration at the water table, and the flow rate of the groundwater beneath the water table will influence the amount of mixing and radionuclide dilution that takes place during transport. The aim of the repository plan is to assure that radiation doses to individuals resulting from contamination of the aquifer remain within "acceptable limits" for some period of time in the future.

Since there is no safe dose of radiation, the only acceptable limit is zero release.

For more information, visit the NIRS website at www.nirs.org

-- Mary Olson, November, 1998