

Relying on geology to jail nuclear waste

In 1957, the National Academy of Sciences recommended disposing of nuclear waste in special geologic formations underground. Deep rock deposits, according to its rationale, would contain the debris of the Atomic Age for millennia, keeping it isolated from society. Last week brought mixed news about the United States' efforts to carry out geologic disposal of nuclear waste.

In the bad-news category, federal scientists reported potential problems at Yucca Mountain, Nev., where the Department of Energy is considering constructing an underground repository for 70,000 tons of spent fuel from nuclear power plants and other highly radioactive waste. In 1987, Congress chose Yucca Mountain as the only candidate site because its extremely arid rock layers would, in theory, keep water from dispersing the radioactive isotopes. Experiments conducted this year, however, indicate that rainwater is leaking through the mountain faster than previous studies had predicted.

On the other hand, the Energy Department got some welcome news about an underground repository in southern New Mexico called the Waste Isolation Pilot Plant (WIPP). Excavated from a salt deposit, WIPP is designed to hold defense-related waste contaminated with radioactivity during the production of nuclear weapons. Last week, the Environmental Protection Agency gave provisional approval for opening WIPP.

The Yucca Mountain data came to light at a meeting of the Geological Society of America in Salt Lake City. Donald S. Sweetkind of the U.S. Geological Survey in Denver reported on measurements made in an exploratory tunnel cutting through the mountain. His group detected elevated concentrations of chlorine-36—a radioactive isotope—in rock samples taken from several locations in the tunnel.

The chlorine-36, says Sweetkind, comes from above-ground nuclear weapons tests conducted in the 1950s and 1960s. Its presence in the tunnel at four times the natural concentration indicates that rainwater has traveled through fractures in the rock, reaching several hundred meters into the mountain in 4 decades.

"It's certainly a bad sign. It's a new wrinkle that definitely has to be considered in terms of the rapidity of flow. But I can't say that this is a [finding] that will kill the performance of the repository," says Sweetkind.

The available data do not tell how much water is flowing through the rock at the level of the planned repository, says June T. Fabryka-Martin of the Los Alamos (N.M.) National Laboratory, who led the chlorine-36 study. The seepage rate is important because abundant water

would corrode the waste canisters and carry the radioactive isotopes down to the water table, where they could spread and eventually contaminate drinking water. By law, the repository and the specially designed canisters must limit leakage for the next 10,000 years.

The tunnel is currently dry: There are no places where water is trickling in. This indicates that little liquid is flowing through the rock today, says Fabryka-Martin. During the last ice age, however, the region received more rain than it does now. "Under a wetter climate in the future, the sites where we have found elevated chlorine-36 might be potential areas for seeps," says Fabryka-Martin.

Next year, the Department of Energy, which oversees the Yucca Mountain project, will issue a preliminary assessment of the site's suitability for storage. Opponents view the new measurements as a serious blow to the planned repository. "I think they're in a lot of trouble regarding the performance of this site," says Robert R. Loux of Nevada's Agency for Nuclear Projects in Carson City.

Russell L. Patterson, a hydrologist with the Energy Department, disagrees. Scientists had acknowledged the possibility that water could move through so-called fast pathways, so the new data were not totally unanticipated, he says. In fact, he views the movement of water through the rock as a potential benefit. "It prevents moisture from [pooling] at the level of the repository and limits the



A tunnel-boring machine completed an 8-kilometer-long shaft inside Yucca Mountain in April.

amount of moisture that comes in contact with the waste containers," he says.

Last week's provisional EPA approval for WIPP brings the New Mexico repository one step closer to opening, which could take place as early as May 1998. "This is a very important action by EPA," says Lokesh Chaturvedi of the Environmental Evaluation Group in Albuquerque, an independent technical review panel.

He notes, however, that many potential roadblocks remain before canisters can enter WIPP. Because the defense waste includes hazardous chemicals as well as radioactive isotopes, New Mexico must grant a disposal permit for WIPP. The laws governing hazardous waste have been challenged often in court, and opponents of WIPP may follow legal paths to block the facility's opening. —R. Monastersky

Clinton's stand on climate

"Make no mistake, the [threat of global warming] is real. If we do not change our course now, the consequences sooner or later will be destructive for America and for the world."

With that preface, President Clinton unveiled the position he has instructed U.S. negotiators to take during a resumption of deliberations on a global climate change treaty.

For the past week, representatives of some 150 nations have been meeting in Bonn, Germany, to iron out compromises on a number of fairly disparate positions. If they succeed, a United Nations treaty could emerge in December during a follow-up meeting in Kyoto, Japan.

Clinton's three-pronged policy, announced on Oct. 22, mandates a U.S. cutback of carbon dioxide and other greenhouse gas emissions to 1990 levels within 11 to 15 years. Emissions in the United States today exceed those in 1990 by 7.5 percent and by 2000 are projected to exceed the 1990 target by 13 percent.

The policy also calls for creation of an international emissions-trading sys-

tem, whereby one nation could invest in programs that reduce emissions in another country and receive credit for those greenhouse gas reductions at home, and for mandatory participation by developing nations in substantive emissions reduction efforts.

Japan, meanwhile, is advocating a cut in greenhouse gas emissions to 5 percent below 1990 levels for the same target period. The European Union has taken an even more ambitious stance. By 2010, it wants a reduction in emissions to 15 percent below 1990 levels.

Clinton also proposed new domestic programs, starting with \$5 billion in tax cuts and research investments over the next 5 years to encourage conservation and the development of cleaner energy technologies.

Industrial nations, which to date have spewed most of the pollutants that threaten a dangerous warming of Earth's climate, must take the lead in curbing emissions, Clinton said. However, he added, "the United States will not assume binding obligations unless key developing nations meaningfully participate in this effort." —J. Raloff