First Nuclear Waste Dump Finally Ready

After three years of delays, the Department of Energy last week declared itself ready to open the nation's first permanent repository for nuclear waste. The opening of this controversial facility, located deep beneath the desert near Carlsbad, N.M., will inaugurate a new phase in the nuclear history of the United States.

But before DOE could actually transport the first waste shipments from Idaho to the storage facility, New Mexico's attorney general moved this week to file suit in federal court to temporarily block the facility's opening.

The repository, called the Waste Isolation Pilot Plant (WIPP), consists of 56 rooms, each as long as a football field, carved out of a salt formation 653 meters underground. If it passes the federal approval process, it will serve as a permanent disposal site for waste contaminated by plutonium and other radioactive nuclides during the production of nuclear weapons. WIPP's opening represents a milestone in the nation's efforts to deal with the tons of nuclear wastes that have accumulated over the decades.

DOE originally planned to open WIPP in October 1988 to begin a testing phase, during which the repository would receive limited numbers of waste canisters. But the department had not completed the facility by that time, and numerous technical problems delayed the project.

By initiating a suit against DOE, New Mexico officials hope to stall the waste shipments long enough to resolve certain issues, Governor Bruce King announced last week.

The battle between New Mexico and the Energy Department centers largely on the amount of waste WIPP will store during its six-year testing phase, when DOE researchers will attempt to prove that the facility can meet federal regulations governing long-term disposal of nuclear material.

Last year, DOE announced it would place 4,250 drums of waste — 0.5 percent of the repository's capacity — into WIPP's underground chambers during the testing period. Department officials said they wanted to study gas generated by the waste in order to address concerns that gas pressure will build rapidly in the WIPP rooms. This past summer, however, DOE declared its intention to load the facility with up to 1 percent of its capacity, saying the testing process might require more flexibility.

The State of New Mexico and some members of its congressional delegation contend the limit should remain 0.5 percent. "The Department of Energy has never justified the need for doubling the amount of transuranic waste for the experimental program," says Sen. Jeff Bingaman (D-N.M.).

"We are not satisfied that all the waste used in the tests will be retrieved and disposed of elsewhere in the event WIPP does not prove to be a suitable long-term disposal site," Governor King said last week.

The Environmental Evaluation Group (EEG), an Albuquerque-based organization charged by DOE with overseeing the WIPP project, has long maintained that the department should not put any more waste than necessary into WIPP during the experimental phase, because the tests might indicate a need to process the waste before permanent storage. Workers would then have to remove waste already placed in WIPP — a potentially dangerous procedure.

"EEG supports a maximum of 0.5 percent for experiments in the mine that DOE has identified they need. That's all that they have identified they need," says EEG Director Robert H. Neill.

This percentage debate "doesn't appear to be an issue that would be irreconcilable when you look at all the issues involved," he adds.

Charles Fairhurst, who chairs the National Academy of Sciences' committee on WIPP, says he personally believes 1 percent represents a reasonable limit for the experimental phase. "It is always a good idea to have some flexibility in a testing program," he told SCIENCE NEWS.

— *R. Monastersky*

Exploring trihydrogen auroras, by Jove!

Using an infrared telescope, two research teams have independently produced the most detailed images ever of auroras in Jupiter's atmosphere. These radiant regions — shaped like a pair of croissants over vast sections of Jupiter's north and south polar areas — vary in brightness on time scales as short as an hour.

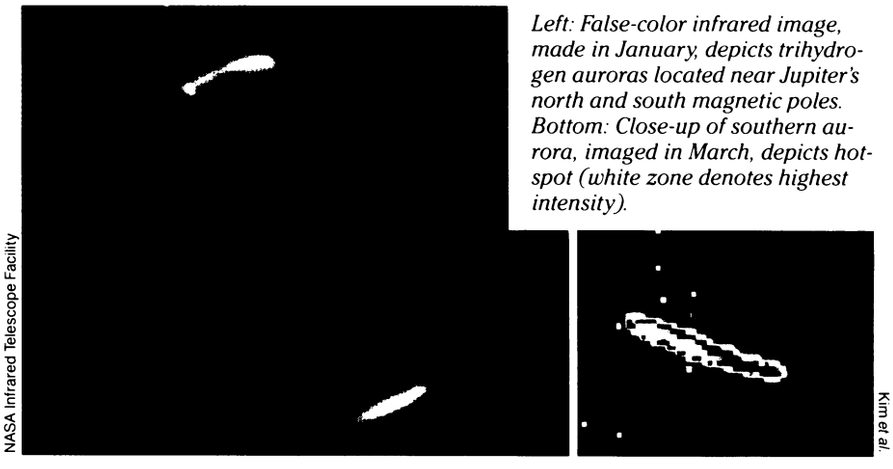
The infrared glow stems primarily from ions of trihydrogen — a simple molecule that many astronomers believe may trigger complex chemical reactions in interstellar gas clouds. For more than a decade, scientists searched in vain for trihydrogen ions far beyond our solar system, in remote, gaseous regions of the Milky Way. Then, in 1989, the elusive molecule turned up close to home, in infrared emissions from the hydrogen-rich atmosphere of Jupiter.

That discovery prompted researchers to obtain the new infrared images, which show the spatial distribution of the trihydrogen emissions, says Sang J. Kim of the University of Maryland in College Park. He and his colleagues conducted one of the two imaging studies undertaken early this year with NASA's Infrared Telescope Facility in Hawaii.

Jovian auroral storms, like those on Earth, develop when electrically charged particles crash into the magnetic field surrounding the planet and then spiral inward toward the north and south magnetic poles. When these particles hit the upper atmosphere, they excite atoms and molecules there, causing them to glow.

The ions that strike Earth's atmosphere come from the sun. But Jupiter lies five times farther from the sun, and astronomers have speculated that most of the particles bombarding its atmosphere come instead from ions spewed out by volcanoes on Io, one of Jupiter's moons.

The infrared studies call that scenario into question, says Kim. "Everything [in the new findings] is against common sense, everything is against our predictions," he asserts. For example, he says,



NASA Infrared Telescope Facility

Kim *et al.*

Left: False-color infrared image, made in January, depicts trihydrogen auroras located near Jupiter's north and south magnetic poles. Bottom: Close-up of southern aurora, imaged in March, depicts hotspot (white zone denotes highest intensity).