

## Desert tunnel is the key to U.S. nuclear energy production

by Dana Wilkie - CNS

YUCCA MOUNTAIN, Nev. - From the 4,950-foot crest of Yucca Mountain, the valley below is a spectacular sweep of desert landscape - ringed by the Funeral and Chocolate mountains, colored by blue-gray sage and pocked by red-and-black cones that represent the area's last gasps of volcanic activity.

Standing here, it is difficult to believe that 400 yards below one's feet lies a 5-mile tunnel carved out of the mountain's limestone - a tunnel that may one day hold the nation's spent nuclear fuel and that is crucial to President Bush's plan to diversify the country's energy portfolio and address the international clamor to fight global warming.

What happens with this cave-like corridor in the coming 18 months could, in the view of some, determine whether nuclear energy will blossom as an alternative to carbon-based electricity generation, or whether the decades-long effort to build a burial spot for high-level radioactive waste at the Yucca Mountain Project will sputter and perhaps die.

"Opening Yucca Mountain is regarded as very important by the U.S. nuclear industry to its renaissance," said Allison Macfarlane, a George Mason University expert on Yucca. "Each time they (in the federal government) say they need more time, I think the overall impression is that the repository is that much further in trouble."

For decades, leading scientists have disagreed so starkly about the Nevada site's geology, hydrology and seismology that one wonders if they're talking about the same place. Likely, their disagreements reflect the difficulty of accurately predicting what will happen thousands of years from now to the radioactive waste buried at this first-of-its-kind repository.

Today - with the Yucca project two decades behind schedule, utilities suing the federal government to take the waste off their hands and the Bush administration seeking electricity sources that aren't culprits in global warming - the U.S. Department of Energy is scrambling to prepare a license application for Yucca, which it hopes to give the U.S. Nuclear Regulatory Commission next summer.

After that, the decision whether to proceed with Yucca's construction will lie with five regulators largely sympathetic to Bush's plan for a resurgence of nuclear power, which depends on a place to store highly radioactive byproducts that can remain dangerous for many thousands of years.

If the department cannot submit the license application by next summer, there are fears the Yucca repository may suffer a fatal blow.

"They're very concerned about actually getting this application done in time for 2008," said Jon Summers, spokesman for Senate Majority Leader Harry Reid, the Nevada Democrat who vows to kill the Yucca project. "If they don't get it done by 2008, the project may not happen."

Macfarlane isn't convinced the project would die, but she agrees more delays won't be good news for utilities banking on Yucca's opening as they prepare to build 27 new reactor units. Courts are already siding with utilities suing the DOE for failing to open Yucca and take waste off their hands.

"Limited storage capacity, the federal government's legal obligation to take possession of used fuel, and the need to dispose of high-level defense waste requires a deep geologic repository at some point in the future," said Trish Conrad, spokeswoman for the Nuclear Energy Institute, the industry's main trade group.

The two-hour drive from Las Vegas to Yucca begins at the southern tip of Nevada and moves northwest - down Interstate 95, deep into the sage- and creosote-bush-splattered Amargosa Valley and briefly through the Nevada Test Site, a Rhode-Island-sized expanse marred by craters from military test bombs.

The turnoff toward Yucca comes after a lonely corner with an "all nude" Kingdom Gentleman's Club. From here, it is another 45 minutes along barren roads and gravelly switchbacks to Yucca's crest, where one gets a 360-degree view of the surrounding valley and some appreciation for the area's isolation. The closest population center is Indian Wells, with 4,865 people.

Below one's feet lies the tunnel, hewn by the "Yucca Mucker," a 720-ton, cylinder-shaped contraption that cuts rock at a rate of 18 feet per hour. It took the "Yucca Mucker" from the summer of 1994 to the spring of 1997 to carve the tunnel, whose innards are now reinforced by steel rails.

Although the dump's projected 2017 opening date is already two decades behind schedule, activity at Yucca is in a lull - thanks to a recent \$50 million funding cut engineered by Reid. A work force of 180 has been slashed by two-thirds as the DOE funnels scarce resources into preparing the license application.

During the decade since the tunnel was carved, engineers have been conducting tests to ascertain how long steel-packaged nuclear fuel can safely remain in the 2,000 acres of burial space that will lie along 42 finger-like extensions off this tunnel. For instance, to simulate the heat generated by spent fuel - which resembles a bunch of hard, black marbles - engineers have subjected the couch-length steel canisters to 400-degree temperatures, hot enough to cook a turkey.

"This is not liquid oozing from barrels," said Michael Voegele, once Yucca's senior engineer and now a DOE consultant. "It's metals, ceramics and plastics, not green goop."

While some in the scientific community believe the steel containers may last a couple of thousand years, Bob Loux - director of the Nevada Agency on Nuclear Projects - believes the standard should be hundreds of thousands of years, as some radioactive elements can remain dangerous that long.

"We don't believe any metal will last longer than 500 years underground at Yucca Mountain," Loux says.

In cool, cave-like alcoves branching off the tunnel, engineers have drilled holes in the rock walls, and then installed a drip system to study how water moves through the mountain. They have imagined that 14 kilometers away lives a "reasonably maximally exposed individual" - someone who draws all drinking, cooking and bathing water from a desert well. They calculate how long it might take for radionuclides to escape their steel canisters, migrate through Yucca's rock, find their way to groundwater and move below this hypothetical man.

These tests demonstrate that radionuclides could show up in drinking water in 50 years or less, and that water in the rocks contains lead, arsenic, mercury and other substances that might eat away at canisters, Loux says.

Allen Benson, spokesman for the Yucca Mountain Project, says the tests show that the earliest that radionuclides might get into groundwater is 50 years, but that the latest is 600,000 years. In fact, he said, neither extreme is probable and it's more likely radionuclides would migrate to groundwater after several thousand years. Even then, the DOE goal is to ensure radioactivity is so diluted it poses no human or environmental danger.

"(Loux's) position is that absolutely no radionuclides can ever be released from the repository," said Benson, noting it is not unusual for water to contain trace amounts of lead, arsenic or mercury. "All (U.S. Environmental Protection Agency) regulations dealing with pollutants recognize that it is impossible to guarantee that no pollutants will ever be released from any disposal facility."

Critics say an earthquake could damage the canisters and allow radioactive releases, that the site has 33 earthquake faults and that there was a 5.9 quake in 1992 that destroyed buildings at the Yucca Mountain Project.

Benson says the 1992 quake only broke windows at one building, while Voegele points out that boulders teetering along mountain ridges have stood there thousands of years.

"There's not been enough shaking in this valley in the past 500,000 years to dislodge" them, said Voegele, who turns his face toward the desert valley and sighs. "I used to hope my son wouldn't have to work on this project. Now I'm just hoping my grandchildren won't."

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