

October, 2001

## **What's Wrong with Burying Nuclear Waste at Yucca Mountain?**

In 1987 Congress selected Yucca Mountain in Nevada as the sole candidate to be studied for a permanent repository for high-level nuclear waste from the nation's commercial reactors. Unfortunately, the decision was based more on political expediency than scientific consensus.

While the risks of transporting and burying highly toxic nuclear waste make geologic disposal a flawed concept, the Yucca Mountain site presents unique problems. Since the mountains selection, site suitability studies have raised serious technical questions while the Department of Energy's program has run over budget and provoked extensive criticism.

### **An Unsuitable Site**

The toxic materials in irradiated reactor fuel will remain lethal for hundreds of thousands of years. In the early 1980s, burial of the high-level waste was seen by many as the best option for disposal. Since then, however, complex and significant doubts have been raised about a geologic repository's ability to ensure the irradiated fuels isolation. Yucca Mountain in particular has numerous specific features that make the site unsuitable for the task.

### **Earthquakes**

At least 33 known earthquake faults lie in Yucca Mountain's vicinity. Studies by the Geological Survey discovered that the Ghost Dance Fault, which crosses the site, may be the primary fault of a complex fault zone. [1] The area is seismically active. In 1992 an earthquake that registered 5.6 on the Richter scale occurred 12 miles away. The Nuclear Waste Technical Review Board (NWTRB), an advisory body established by the Nuclear Waste Policy Act to monitor the waste program, also warns that extensive fault systems may not leave sufficient emplacement space for nuclear waste. [2]

Another danger from the regions seismic activity involves the water table, which is 300 meters below the proposed repository. Former senior Department of Energy geologist Jerry Szymanski has found that an earthquake could dramatically elevate the table, flooding the repository with water. [3]

### **Water**

The movement of water through the site also represents a serious threat to a repository. One of Yucca Mountain's supposed advantages is slow travel time of the water through the ground. Studies suggest, however, that water may move through the mountain at rates faster than once thought. [4] The extensive fault system in the area also creates a risk that pathways may be created through Yucca Mountain's highly fractured rock for water to reach the repository directly.

Nevada state scientists are also concerned that a repository may lead to groundwater contamination, fearing that groundwater travel time from the repository to the environment is less than 1,000 years, instead of the many thousand years that DOE believes.[5]

### **Volcanic Activity**

A volcano 20 kilometers away from the site appears to have erupted within the last 20,000 years, rather than 270,000 as once thought.[6] The interval becomes comparatively small when one remembers that the materials to be buried at Yucca will remain highly toxic for a quarter of a million years.

### **Defense Wastes**

In addition to holding irradiated fuel from commercial reactors, Yucca Mountain is the intended destination for certain defense wastes in the form of vitrified borosilicate glass. Vitrified glass, however, may disintegrate rapidly in conditions like those at Yucca Mountain, which may result in massive groundwater contamination. [7]

### **Criticality**

A team of scientists at the Los Alamos National Laboratory in New Mexico fear that burying waste at Yucca Mountain could lead to a spontaneous atomic explosion, releasing radiation into the atmosphere and groundwater. According to their analysis, plutonium could escape from disposal canisters into the surrounding rock, which possesses physical properties that might aid a spontaneous chain reaction and explosion. Another team of scientists at the DOE facility at Savannah River has endorsed this thesis. [8]

### **Mineral Resources**

Yucca Mountain is located in an area rich with mineral resources, which may lead to human intrusion upon the site after waste has been deposited. [9]

### **Political Considerations**

### **Federalism/State Authority**

Although Nevada has no nuclear reactors, Congress chose the state to be the only candidate for a permanent repository. Nevada has a long history of vigorous opposition to the repository. In 1989 the state passed a law to prohibit the storage or disposal of high-level nuclear waste within Nevada, and public opinion polls consistently show strong citizen disapproval of the dump. While current law prohibits the placing of an interim facility for high-level nuclear waste in Nevada, legislation now before Congress would circumvent the restriction and allow the preemption of Nevada state laws, raising issues of federal preemption and state sovereignty.

### **Legacy of Doubt**

One legacy of the DOE's handling of the characterization study (see below) is deep mistrust of the department by residents of Nevada. While considerable anger remains from the manner in which Yucca Mountain was selected as the only candidate for a repository, much citizen opposition stems from the realities of nuclear waste disposition. As one DOE-commissioned report observes, "[p]ublic mistrust of DOE's nuclear waste storage program is sometimes rooted in irrational fear of unknown risk to health and safety, but more often reflects a rational understanding of the current state of scientific knowledge and of DOE's past history of covering up mistakes and censoring bad news." [10]

### **Native American Sovereignty**

The federal government may lack authority to even use Yucca Mountain. The site lays in an area that part of the traditional lands of the Western Shoshone tribe. The Shoshone nation claims the area vicinity under the Treaty of Ruby Valley, signed in 1863, and opposes the DOE's plans for Yucca Mountain. [11]

### **DOE Management at Yucca: A Legacy of Failure**

The DOE expects to determine whether the Yucca Mountain site is technically suitable for a repository in 1998. The nuclear industry is backing legislation to explicitly waive environmental regulations for a repository. Even without such legislation, however, mismanagement and cost overruns call into question the integrity and effectiveness of the site suitability studies. Numerous observers have taken the DOE to task for its management of the study.

### **Project Integrity**

Nevada's elected representatives have long accused the DOE of failing to conduct an honest evaluation of Yucca Mountain, but even individuals employed by the department have come to the same conclusion. Retired Air Force Brigadier General Joel T. Hall, employed by a DOE contractor to determine ways to improve the credibility of the Yucca Mountain program, wrote a letter to then-DOE Secretary James Watkins and accused the Department of using its studies not for site suitability research, but as a prelude to applying for a construction license. "It is a sad day for our country when the public

becomes unjustly cynical about the integrity of public officials, he wrote."But, it is so much sadder when the cynicism is justified. The Yucca Mountain Project falls in the latter category." [12]

### **Money Down the Hole**

The poor management of the site characterization presents a financial drain as program costs continue to escalate. Characterization of Yucca Mountain, once estimated in the hundreds of millions, may cost in excess of \$6 billion. [13] Most of these payments come from the Nuclear Waste Fund, which is financed by a tenth of a cent per kilowatt hour fee assessed to nuclear utilities. The waste fund is likely to prove inadequate because the fee has not changed since its establishment in 1983. In the intervening 12 years, inflation eroded the fees buying power by 40 percent. [14] Although the fund has collected in excess of \$8 billion, over \$4 billion has already been spent, [15] including \$392.8 million from the fund in FY'95.

### **Continuing Problems and New Misdirections**

While the DOE claims to be instituting management reform of the project, thorough site suitability analysis continues to be sacrificed on the altar of expediency. DOE's new program approach in many ways worsens the problem of data collection. In March 1995 the NWTRB expressed concern that increased technical and scientific uncertainties will be created because less data and analysis than previously planned will be available prior to determining site suitability. [16] NWTRB Chairman Dr. John E. Cantlon testified that the existing schedule may be inadequate for site exploration or the accommodation of unforeseen circumstances. "The Board is very concerned that important program decisions are being driven by unrealistic deadlines." [17]

The deferral of important studies has already drawn the attention of affected parties outside of Nevada. In a letter to DOE Secretary Hazel O'Leary, dated January 31, 1995, Senators Barbara Boxer and Dianne Feinstein raised questions about the effect of the new approach on understanding how a repository at Yucca Mountain might affect the Death Valley National Park. "We are concerned that, while earlier plans indicated an effort would be made to define and analyze the regional groundwater flow system... the new program approach defers development of an understanding of the regional ground-water flow system until after the technical determination of site suitability."

Another continuing problem is the failure to fully fund scientific research of the sites suitability. The General Accounting Office has commented that the DOE devotes most project funds to infrastructure and a relatively small amount to essential characterization studies. At the same time, the agency reduced the time allotted for various studies; a move which could increase the risk that the site investigation will be inadequate and comes at a time when unanticipated technical issues have emerged that could lengthen the investigation. [18]

### **Studies Deferred**

In March 1995 the NWTRB expressed concern that the DOE is delaying important studies of areas of the site until after the determination of site suitability. The Board also noted the need for more data on how Yucca Mountain's rock would respond to heat generated by nuclear waste. "Unfortunately, no hydrogeologic data from thermal testing in the exploratory facility will be available to support a 1998 site-suitability determination. The Board is very uneasy about this." [19] The Board further noted that the DOE's preparation of an Environmental Impact Statement for the repository may not place sufficient emphasis on the release of radiation into the environment. [20]

The DOE is also altering its plans at Yucca in a manner that may cast further doubt upon the site suitability decision. The NWTRB recently expressed concern that while the DOE had placed an emphasis on natural geologic barriers to prevent nuclear waste from entering the environment, the department appears to have shifted its focus to engineered barriers as the wastes primary containment, using geologic barriers as a backup. The effectiveness of this backup, however, will take longer to demonstrate. The Board questioned whether the new strategy will provide adequate protection and if demonstration of geologic isolation could wait until after site suitability had been determined. [21]

### **Calls for an Independent Review**

Independent bodies like the General Accounting Office and the Nuclear Waste Technical Review Board have consistently called for an independent review of the Yucca Mountain project and, in the case of the GAO, of the nation's entire nuclear waste policy. "Without a comprehensive independent review of the disposal program and its policies," warns the GAO, "millions -- if not billions -- of dollars could be wasted." [22]

#### References:

- [1] The General Accounting Office, Nuclear Waste: Yucca Mountain Project Behind Schedule and Facing Major Scientific Uncertainties (GAO/RCED-93-124), p. 43.
- [2] Enclosure of letter from John E. Cantlon, Chairman NWTRB, to Daniel A. Dreyfus, Director OCRWM, December 6, 1994.
- [3] Nicholas Lenssen, "Nuclear Waste: The Problem That Won't Go Away." Worldwatch Paper 106, December 1991, p. 17.
- [4] Keith Rogers, "Policy holds no alternative to Yucca Mountain," Las Vegas Review-Journal. October 13, 1994, p. 4A; Lester R. Brown, et al, Vital Signs 1995: The Trends that Are Shaping Our Future. (Worldwatch Institute/W.W. Norton: New York, 1995), p. 88.
- [5] State of Nevada Nuclear Waste Project Office, "Scientific and Technical Concerns," p. 14.
- [6] Lenssen., 27.
- [7] Arjun Makhijani, "Glass in the Rocks: Some Issues Concerning the Disposal of Radioactive Borosilicate Glass in a Yucca Mountain Repository," prepared for the State of Nevada, January 29, 1991. [8] William J. Broad, "Scientists Fear Atomic Explosion of Buried Waste." The New York Times, March 5, 1995, p. 1; William J. Broad, "Theory on Threat of Blast at Nuclear Waste Site Gains Support." The New York Times, March 23,

1995, p. A18.

[9] Scott Saleska, Nuclear Legacy: An Overview of the Places, Problems, and Politics of Radioactive Waste in the U.S (Public Citizen, September 1989), p. VII-7.

[10] James Thurber, Report on Selected Published Works and Written Comments Regarding the Office of Civilian Radioactive Waste Management Program. Center for Congressional and Presidential Studies, School of Public Affairs, The American University (Washington, March 1, 1994), p. 17.

[11]Memorandum from Ian D. Zabarte, Manager Western Shoshone National Council-Nuclear Waste Program. May 16, 1994. [12]Letter from Joel T. Hall to James D. Watkins, April 22, 1992, p. 7.

[13] U.S. Department of Energy, Civilian Radioactive Waste Management Program Plan: Volume I, Program Overview (Washington, December 19, 1994), p. 6.

[14]Citizens United to Terminate Subsidies (a coalition of Friends of the Earth and the National Taxpayers Union Foundation), The Green Scissors Report: Cutting Wasteful and Environmentally Harmful Spending and Subsidies (Washington, 1995), p. 23.

[15]Fact sheets provided by Gary Huettel of the Office of Civilian Radioactive Waste Management, February 24, 1995.

[16]Written testimony of Dr. John E. Cantlon, Chairman Nuclear Waste Technical Review Board, before the Subcommittee on Energy and Water Development of the House Committee on Appropriations. March 16, 1995, p. 7.

[17]Ibid., p. 11.

[18]The General Accounting Office, Nuclear Waste: Yucca Mountain Project Behind Schedule and Facing Major Scientific Uncertainties (GAO/RCED-93-124), p. 3.

[19]Letter from John E. Cantlon, Chairman NWTRB to Daniel A. Dreyfus, Director OCRWM, March 3, 1995.

[20]Ibid.

[21]Ibid.

[22]General Accounting Office, Nuclear Waste: Comprehensive Review of the Disposal Program is Needed (GAO/RCED-94-299), p. 2.