



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

DOCKET CONTROL  
CENTER

'87 MAR 19 P12:04

Reply to:  
1050 East Flamingo Rd.  
Suite 319  
Las Vegas, Nevada 89119  
Tel: (702) 388-6125  
FTS: 598-6125

TO: King Stablein  
FROM: Paul T. Prestholt, Sr. On-Site Licensing Representative  
DATE: March 16, 1987  
SUBJECT: Six Nevada Nuclear Waste Factsheets; Map

Please find enclosed the above-referenced Factsheets for your file. Our office received two sets this date.

PTP:nan

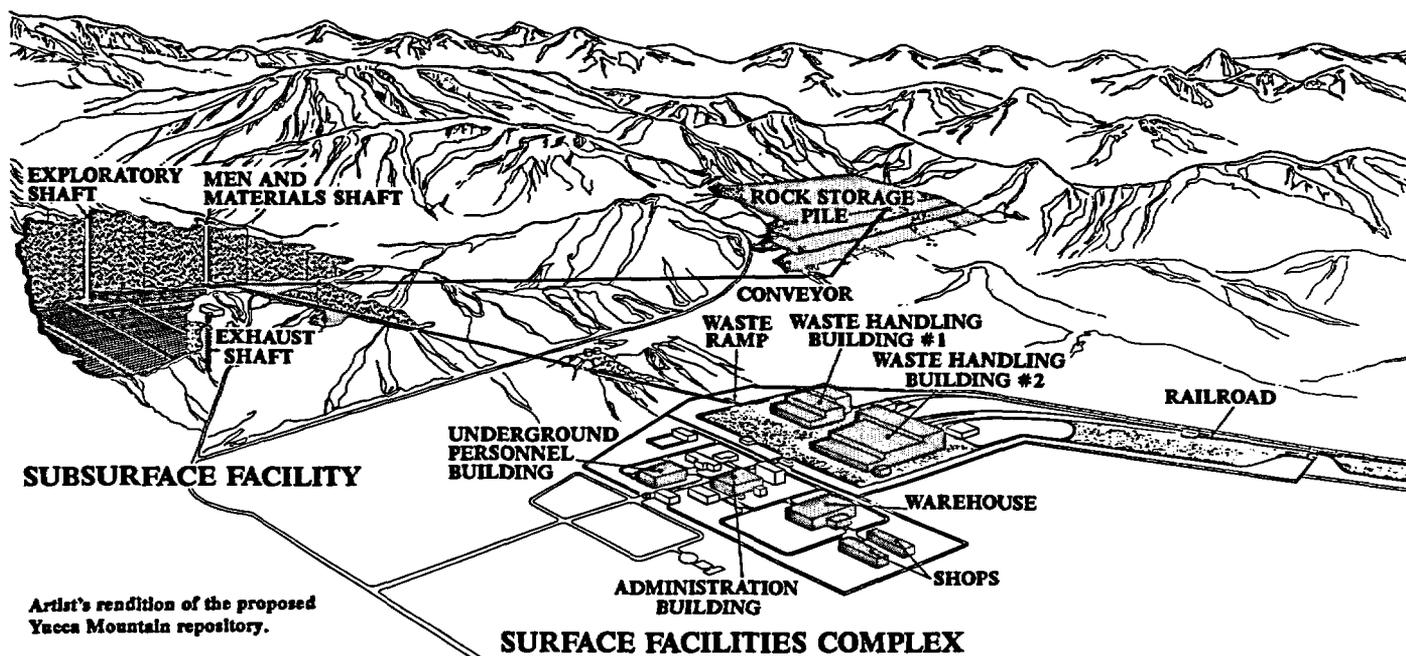
WM Record File 102 WM Project 11  
Docket No. \_\_\_\_\_  
PDR ✓  
LPDR N

Distribution:  
STABLEIN \_\_\_\_\_  
SSA \_\_\_\_\_  
(Return to WM, 623-SS)

8706250127 870316  
PDR WASTE  
WM-11 PDR

# Nevada Nuclear Waste Factsheet 1

## A Yucca Mountain repository: What will it look like?



Artist's rendition of the proposed Yucca Mountain repository.

If Yucca Mountain meets all the required tests and approvals, DOE plans to begin construction in late 1993. There would be a central surface facility covering 150 acres, as well as the underground repository spreading over 1,500 acres.

The probable location for the surface facilities would be on the east side of Yucca Mountain. They would be used for waste-handling and packaging operations in support of the underground activities, and to provide general repository support services. There would be fire and medical services as well as administrative offices, repair shops, a security office, warehouses, two separate waste-handling buildings, a machine shop and electrical shop.

Utilities, roads and a railroad would be extended to the site. New wells with storage provisions would supply the water required during construction and operation of the repository.

The subsurface facilities would be a mile west of the surface complex. The repository horizon would be more than 750 feet below the surface and at least 650 feet above the water table. Access to the underground area would be via gently sloping ramps from the surface waste-handling area.

The subsurface facilities consist of main access drifts to the emplacement areas, the emplacement drifts, and service areas near the shafts and ramps. The layout of the facilities depends upon whether the waste

is emplaced vertically or horizontally.

There would be six access openings connecting the subsurface with the surface areas. One would be used to transport personnel and materials. It would be 25 feet in diameter and about 1,110 feet deep. The waste-handling ramp would be used to transport waste underground. It would be 24 feet in diameter and about 6,700 feet long. Another ramp would be used for the mined-material conveyor system and as an exhaust outlet for construction area ventilation. The ramp would be 19 feet in diameter and 4,650 feet long. The remaining three shafts would ventilate various underground areas. □

# We want to hear from YOU...

Please add the following name and address to your mailing list:

---

---

---

My address is incorrect. Please change it to:

---

---

---

I have the following suggestions for newsletter articles:

I'd like you to send me:

1.  Previous Newsletters
2.  Yucca Mountain Repository Map
3.  All Nuclear Waste Fact Sheets  
or
- A Yucca Mountain Repository: What will it look like?
- A Yucca Mountain repository: How would it operate?
- The Nuclear Waste Policy Act of 1982: What does it do?
- What is spent nuclear fuel and how much waste is there?
- Why Yucca Mountain?

**MAIL TO: Nuclear Waste Project Office  
Agency for Nuclear Projects  
Capitol Complex  
Carson City, Nevada 89710**

# Nevada Nuclear Waste Factsheet 2

## A Yucca Mountain repository: How would it operate?

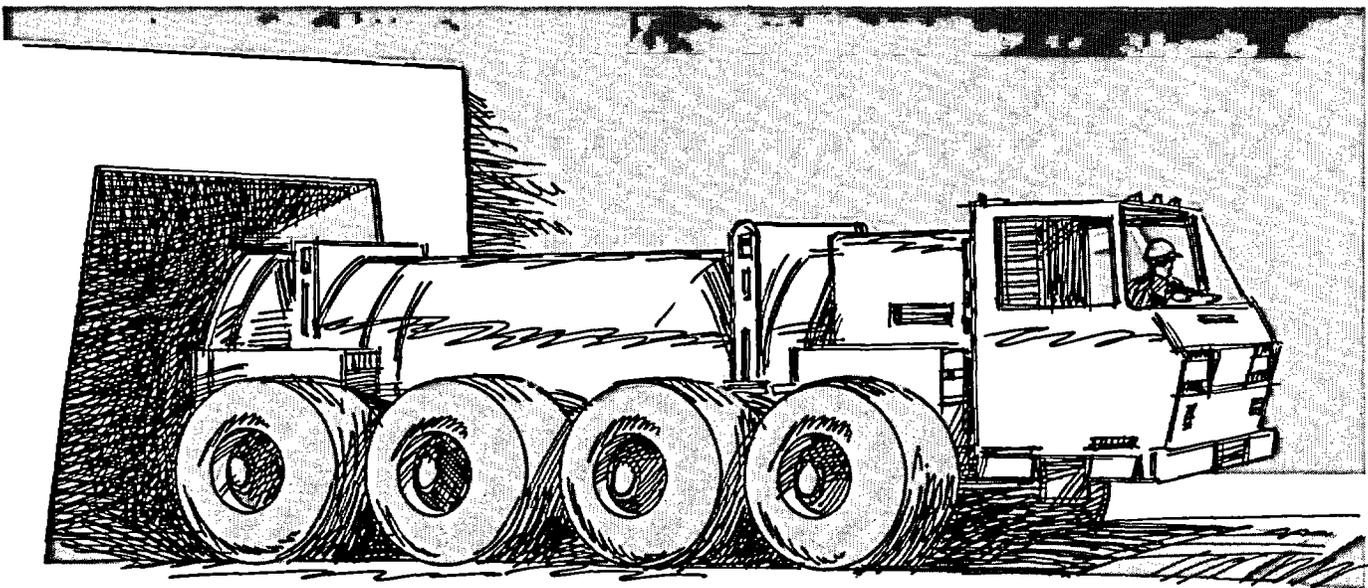
DOE plans to begin construction in late 1993. The plan calls for the first waste to be received in January 1998. The ramp connecting the surface and underground workings will allow vehicles to carry the heavy waste canisters. A conveyor belt ramp will transport the mined rock, about 600 tons per day, to the pyramidal muck-pile at the surface. DOE is leaning toward horizontal, rather than vertical, emplacement of the canisters. About 700 boreholes will be necessary to house the approximately 24,000 canisters that will contain the 70,000 metric tons of waste — the limit imposed by the Nuclear Waste Policy Act of 1982.

A highway for truck and automobile access would be constructed between U.S. Highway 95 and Yucca Mountain. The two-lane road would originate .5 mile west of Amargosa Valley. For rail access, a spur would be constructed in the vicinity of Dike Siding, about 11 miles northeast of Las Vegas. A bridge spanning Fortymile Wash would accommodate both the road and railroad. A railroad facility would be constructed at Yucca Mountain to provide for railcar handling and temporary storage.

The outer perimeter of the repository would be surrounded by a buffer zone 3.1 miles wide. As required by Environmental

Protection Agency standards, there would be no mining and no water pumping from the underlying aquifer.

The operations period of the repository would extend until 2048. The period would consist of a 28-year emplacement phase and a 22-year caretaker phase. A decision to retrieve the waste for reprocessing to recover valuable uranium and plutonium could add 30 years to the repository lifetime. If there were no retrieval, the repository would be decommissioned, sealed and marked. The decommissioning period would end either in 2051 or 2056, depending on the type of waste emplacement. □



A multi-wheeled vehicle is proposed to transport waste from the above-ground handling facility to the underground repository.

# We want to hear from YOU...

Please add the following name and address to your mailing list:

---

---

---

My address is incorrect. Please change it to:

---

---

---

I have the following suggestions for newsletter articles:

I'd like you to send me:

1.  Previous Newsletters
2.  Yucca Mountain Repository Map
3.  All Nuclear Waste Fact Sheets  
or
  - A Yucca Mountain Repository: What will it look like?
  - A Yucca Mountain repository: How would it operate?
  - The Nuclear Waste Policy Act of 1982: What does it do?
  - What is spent nuclear fuel and how much waste is there?
  - Why Yucca Mountain?

**MAIL TO: Nuclear Waste Project Office  
Agency for Nuclear Projects  
Capitol Complex  
Carson City, Nevada 89710**

# Nevada Nuclear Waste Factsheet 3

## The Nuclear Waste Policy Act of 1982. What does it do?

The Nuclear Waste Policy Act of 1982 (NWP) was signed into law by President Reagan on Jan. 7, 1983. Its aim is to establish a fair and impartial federal mechanism for the selection of two repository sites for high level nuclear waste (HLW) and spent nuclear fuel. It emphasizes that geologic consideration is the primary consideration for the selection of the sites. Other important factors to consider in qualifying or disqualifying a site are natural resources, hydrology, geophysics, seismic activity, atomic energy defense activities, and proximity to water supplies and population centers, as well as to components of the National Park System, the National Wildlife Refuge System, the National Wild and Scenic Rivers System, the National Wilderness Preservation System, and to the National Forest Lands.

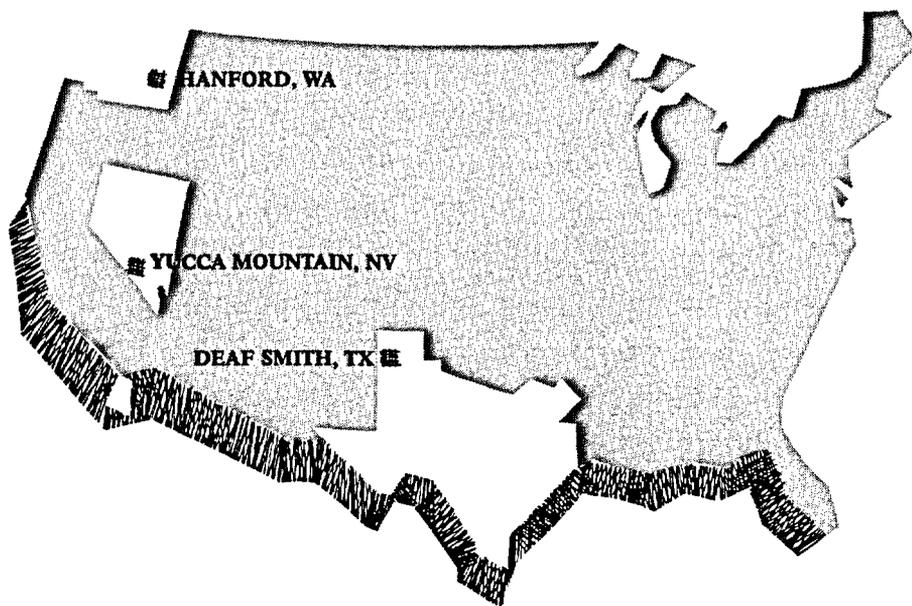
The NWP establishes a schedule for the siting of the first two repositories, although the second repository program was halted indefinitely in May 1986. It establishes a schedule for the construction and operation of the first repository that provides assurance that the public and the environment will be adequately protected against the hazards posed by such wastes. The Department of Energy (DOE) is responsible for conducting the site evaluation process. It found nine sites to start the selection process. The number of sites then was reduced to five and three. Each of the three sites must undergo a scientific evaluation called site characterization which will be used to select the final site. Yucca Mountain, Nevada; Hanford, Washington and Deaf Smith County, Texas, were selected for site characterization in May 1986. The first repository is to be operational by 1998.

The NWP defines the federal responsibilities and policies for the disposal of such wastes and spent fuel. The DOE is responsible for the siting, development, scheduling, construction, and operation for the repositories. The Nuclear Regulatory Commission (NRC) is responsible for the development and the enforcement of standards governing the construction and operation of the repositories and for the licensing process. The Environmental Protection Agency (EPA) is responsible for the development of standards that will protect the environment.

The NWP defines the relationship between the federal government and the state governments with respect to the site selection process and the disposal of such waste and spent fuel. It calls for participation of the affected states in the site char-

acterization process. A federal court has interpreted parts of the NWP as allowing the State of Nevada to perform independent scientific studies and socioeconomic impact studies of the Yucca Mountain site. These independent studies should help the governor exercise fairly the veto, granted to Nevada under the NWP, should Yucca Mountain be selected as the site for the first repository. This veto can only be overridden by a majority vote of both houses of Congress.

The NWP establishes a Nuclear Waste Fund, composed of payments made by the generators and owners of high-level waste and spent fuel. This ensures that the cost of carrying out the siting, development, construction, and operation of the repository is born by those who generate the waste. □



# We want to hear from YOU...

Please add the following name and address to your mailing list:

---

---

---

My address is incorrect. Please change it to:

---

---

---

I have the following suggestions for newsletter articles:

I'd like you to send me:

1.  Previous Newsletters
2.  Yucca Mountain Repository Map
3.  All Nuclear Waste Fact Sheets  
or
- A Yucca Mountain Repository: What will it look like?
- A Yucca Mountain repository: How would it operate?
- The Nuclear Waste Policy Act of 1982: What does it do?
- What is spent nuclear fuel and how much waste is there?
- Why Yucca Mountain?

**MAIL TO: Nuclear Waste Project Office  
Agency for Nuclear Projects  
Capitol Complex  
Carson City, Nevada 89710**

# Nevada Nuclear Waste Factsheet 4

## What is spent nuclear fuel and how much waste is there?

Pellets of uranium oxide are the fuel for most commercial nuclear power plants generating electrical power. These solid pellets are sealed in metal tubes approximately twice the diameter of a pencil and about 12 to 13 feet long. The tubes are bundled together into assemblies, each containing between 50 and 270 tubes, depending on the design of the reactor in which they are to be used. Between the tubes is space for coolant to flow and remove the heat generated by the controlled chain reaction. The reactor core consists of many fuel assemblies.

When an unspent fuel assembly is placed in a reactor, the uranium is 3.3% enriched in the uranium isotope, uranium 235. Every 1,000 kilograms of uranium consists of 33 kilograms of uranium 235 and 967 kilograms of uranium 238. The uranium 235 is fissile and helps maintain the controlled chain reaction but the uranium 238 is not. The assembly is kept in the reactor for about 1,100 days. During this time span, so much fissile material is irradiated that the fuel element can no longer support the chain reaction and it becomes a spent fuel element.

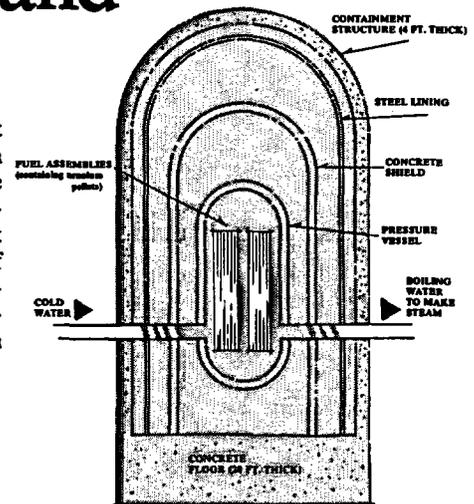
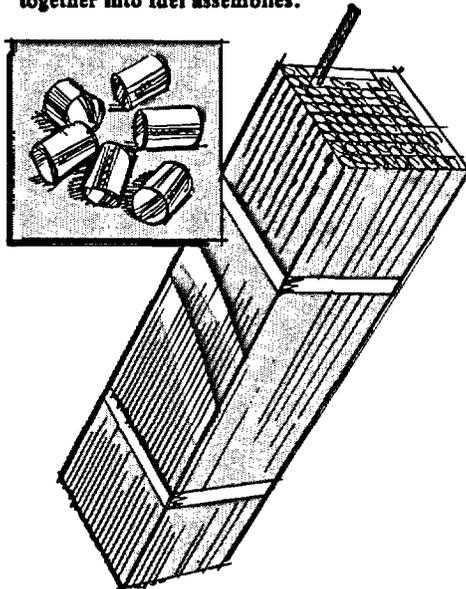
Spent fuel is measured in metric tons of heavy metals (MTHM) or metric tons of uranium (MTU). Over a span of 1,100 days, a typical modern commercial nuclear power plant produces about 100 MTU of spent fuel elements. There are about 100 modern nuclear power plants in the United States and these produce not quite 3,000 MTU of spent fuel elements per year. As of 1986, more than 10,000 MTU of spent fuel elements had been produced by the commercial nuclear power industry. This inventory is expected to increase to 40,000 MTU by the year 2,000.

The radioactive fission products and the transuranics, (isotopes of plutonium, and nuclides with atomic numbers greater than

92 — uranium) in the spent fuel element are the high level waste (HLW). When a spent fuel element is taken out of the reactor, the radioactivity of fission products is so intense that the fuel element continues to generate large amounts of heat. Also, the radiation levels near its surface are so high that it would take an extremely heavy shipping cask to move it a great distance away from the reactor. The spent fuel element is therefore stored in a deep pool of water in the plant building. After about five years of storage, the heat generation rate has decayed to about 10 percent of the initial value and it is possible to ship the spent fuel element to a distant place. However, the spent fuel element still

Nuclear power plants are fueled by pellets of uranium oxide, each about the size of a pencil eraser.

The pellets are sealed into long metal tubes called rods. The rods are then bundled together into fuel assemblies.



In the United States, a series of barriers separates the outside world from the heat and radiation of the nuclear plant's uranium core.

contains a very large amount of dangerous radioactive nuclei. There are about 0.6 kilograms of strontium 90 and 1.2 kilograms of cesium 137 per 1,000 kilograms of uranium, two very hazardous radionuclides that decay with half lives of about 30 years. (Half-life is the time required for a radioactive substance to lose 50 percent of its activity by decay.) The decay of these radionuclides to insignificant levels requires about 1,000 years. Five of the nine kilograms of transuranics are plutonium 239 which decays with a half life of 24,000 years. It takes several hundred thousand years for this amount of plutonium to decay to insignificant levels.

Under the Nuclear Waste Act of 1982, The Department of Energy is allowed to dispose of 70,000 MTU of spent fuel elements in the first repository. This amount of spent fuel will contain about 630 tons of transuranics, mostly plutonium. Because of the hazard associated with such a large amount of plutonium, the DOE must look for the site that can best isolate the waste from the biosphere for 10,000 years. □

# We want to hear from YOU...

Please add the following name and address to your mailing list:

---

---

---

My address is incorrect. Please change it to:

---

---

---

I have the following suggestions for newsletter articles:

I'd like you to send me:

1.  Previous Newsletters
2.  Yucca Mountain Repository Map
3.  All Nuclear Waste Fact Sheets  
or
- A Yucca Mountain Repository: What will it look like?
- A Yucca Mountain repository: How would it operate?
- The Nuclear Waste Policy Act of 1982: What does it do?
- What is spent nuclear fuel and how much waste is there?
- Why Yucca Mountain?

**MAIL TO: Nuclear Waste Project Office  
Agency for Nuclear Projects  
Capitol Complex  
Carson City, Nevada 89710**

# Nevada Nuclear Waste Factsheet 5

## Why Yucca Mountain?

The Nuclear Waste Policy Act of 1982 specifies procedures the Department of Energy must follow in siting the country's first high-level nuclear waste repository. DOE selected Yucca Mountain in southern Nevada as one of three sites to be studied in detail to determine if they can safely isolate the waste for 10,000 years, as the standard requires.

The Yucca Mountain rock is "welded tuff," a dense form of compacted volcanic material laid down more than four million years ago. DOE says the tuff formation provides the large, stable block of rock required for a repository.

When considering any potential site, a

major concern is that water could drain into the repository, pick up radionuclides, and eventually contaminate the underground water supply of the region's farms and communities. Yucca Mountain is in an arid location, and DOE says most of the six-inch-per-year rainfall runs off or evaporates without penetrating the mountain's surface. The DOE says that less than 5 percent of the rainfall percolates down to the water table which would be at least 650 feet below the repository.

DOE hydrologists say that if radionuclides were to dissolve in the water passing through the repository, it is highly unlikely that they could ever reach and con-

taminate the groundwater. They say this is because the tuff contains zeolites, a group of minerals with the capability to remove radioactive material from water. DOE says if radionuclides were released into the water, they would be trapped by the chemical and physical reaction produced by the zeolites.

DOE also says the possibility of an earthquake damaging a repository is unlikely, although it is a subject for "site characterization" study. It says tunnels mined in tuff at the adjacent Nevada Test Site during the last 25 years are still intact despite repeated shocks from nearby weapons detonations.



# We want to hear from YOU...

Please add the following name and address to your mailing list:

---

---

---

My address is incorrect. Please change it to:

---

---

---

I have the following suggestions for newsletter articles:

I'd like you to send me:

1.  Previous Newsletters
2.  Yucca Mountain Repository Map
3.  All Nuclear Waste Fact Sheets  
or
  - A Yucca Mountain Repository: What will it look like?
  - A Yucca Mountain repository: How would it operate?
  - The Nuclear Waste Policy Act of 1982: What does it do?
  - What is spent nuclear fuel and how much waste is there?
  - Why Yucca Mountain?

**MAIL TO: Nuclear Waste Project Office  
Agency for Nuclear Projects  
Capitol Complex  
Carson City, Nevada 89710**

# Nevada Nuclear Waste Factsheet 6

## A Yucca Mountain Repository: What are Nevada's Concerns?

Nevada's major concerns about constructing a high-level nuclear waste repository at Yucca Mountain were summarized in response to the Department of Energy's draft Environmental Assessment in December 1984. The state feels the final EA of May 1986 did not address those concerns adequately.

The summary prepared by the state Nuclear Waste Project Office (NWPO) included these comments:

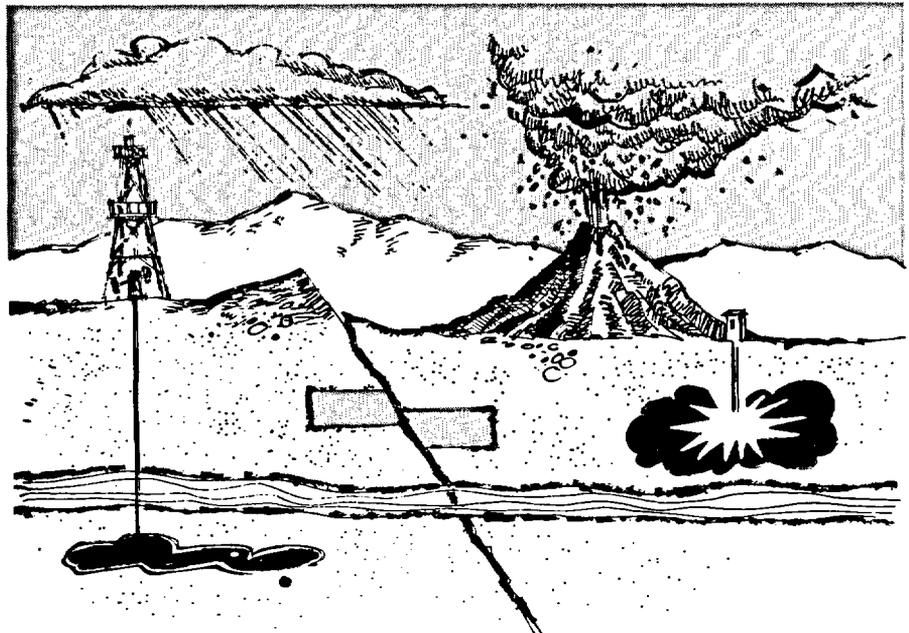
- A reasonable interpretation of the available information suggests that a large earthquake with accompanying surface faulting could probably occur during the lifetime of the facility, with the possibility of loss of repository integrity. The site is located within an active tectonic zone called the Walker Lane Structural Zone, a source of numerous large earthquakes in recorded history. The site area contains a number of faults which may be also capable of generating large earthquakes;
- The EPA standards for disposal of high-level radioactive materials indicate that a site should be disqualified if the ground water travel time from the repository to the accessible environment is less than 1,000 years. NWPO calculations, using conservative approximations to bound numerical uncertainty, find that ground water travel time could range from 900 to 34,000 years. The minimum number for ground water travel time does not meet the EPA ground water travel time requirement;
- A repository at Yucca Mountain may conflict with future weapons testing and the established mission of the adjacent Nevada Test Site. Testing currently is not in areas near

Yucca Mountain, but there must be a Defense Department declaration that future atomic testing will not conflict with a waste repository at Yucca Mountain;

- The potential of natural resources at the site is supported by the presence of gold and silver in drill cores, and the location of Yucca Mountain along the rim of a buried caldera. New studies indicate an overthrust belt marking oil deposits may extend to the site. A regional carbonate aquifer currently being evaluated as a future water supply for southern Nevada also extends beneath the site;
- EA support documents suggest that a risk of volcanic eruption exists at Yucca Mountain. The site is located adjacent to a major volcanic field;
- A review of climatic changes in southern Nevada over the last

10,000 years suggests that under future "wet" cycles (possibly glacial periods), water infiltration may increase and cause a rise in the ground water table. This could potentially impact the site's ability to contain and isolate the waste;

- The EA claims that zeolites, an accessory mineral in volcanic tuff, would retard movement of radionuclides and thus help ensure the isolation capability of the site. However, zeolites may be unstable at expected repository temperatures and thus may not effectively retard radionuclide movement toward the water table. In fact, they could promote instability of underground repository openings;
  - Given the decision to put defense waste as well as commercial waste in
- continued on back*



a repository, it is questionable whether there is sufficient host rock available at Yucca Mountain for emplacing the 70,000 tons allowed by the Nuclear Waste Policy Act.

In addition to these and other technical concerns, Nevada officials fear the state's vital tourist industry could suffer because of a repository at Yucca Mountain. Visitors would have to travel the same highways as trucks carrying nuclear waste. (The EA says the repository receipt facilities could accept 1,000 truck and 500 rail shipments per year, but other figures in the EA indicate there could be up to three times that number of trucks if there is no interim handling facility in the east.) Although casks containing the waste would be designed for maximum safety and security, there almost certainly would be accidents. Tourists could be scared away by the perception of a nuclear disaster.

The state contends the EA presents a "best-case" scenario that minimizes potential impacts to the social and fiscal systems of southern Nevada. Although there would be economic benefits during construction, estimates of direct and indirect employment

figures are highly inflated compared to numbers used for other potential repository sites. Communities would thrive during the construction period, but would be left with empty schools, houses and stores when the boom ends. Moreover, the presence of a nuclear waste repository could be a factor in diverting new business away from Nevada.

Finally, the state contends the Department of Energy has failed to follow the spirit and letter of the Nuclear Waste Policy Act's provisions for carrying out the siting program. Nevada believes decisions on screening and selection of sites have placed primary emphasis on political desires rather than technical merits.

The state's position is that the siting guidelines developed by DOE for screening potential repository sites are vague and subjective, thus allowing DOE to ratify decisions made before the Nuclear Waste Policy Act was enacted.

The state contends the process of nominating five candidate repository sites, recommending three of them to the president for site characterization approval, receiving the president's approval of the

three sites, and the issuance of the environmental assessments — all as one administrative action — was illegal under Section 112 of the Act.

The state has challenged the timing of the secretary's preliminary determination that the three sites selected for characterization are suitable for development as repositories. The determination was made concurrent with the secretary's recommendation of the sites to the president. The state contends that, under the NWPA, such a determination should have been withheld until characterization of the three sites is completed. Otherwise one favored site may emerge as the "winner" because the others deliberately were not studied adequately. Section 112 of the NWPA clearly required DOE to have three sites from which to choose following characterization.

Federal EPA standards require the repository must be able to adequately isolate waste from the biosphere for 10,000 years. The Nuclear Waste Project Office is charged with making sure the giant project moves in strict compliance with the law and that the health, safety and other interests of Nevadans are protected. □

## We want to hear from YOU...

Please add the following name and address to your mailing list:

---

---

---

My address is incorrect. Please change it to:

---

---

---

I have the following suggestions for newsletter articles:

I'd like you to send me:

1.  Previous Newsletters
  2.  Yucca Mountain Repository Map
  3.  All Nuclear Waste Fact Sheets
- or
- A Yucca Mountain Repository: What will it look like?
  - A Yucca Mountain Repository: How would it operate?
  - The Nuclear Waste Policy Act of 1982: What does it do?
  - What is spent nuclear fuel and how much waste is there?
  - Why Yucca Mountain?
  - A Yucca Mountain Repository: What are Nevada's Concerns?

**MAIL TO: Nuclear Waste Project Office  
Agency for Nuclear Projects  
Capitol Complex  
Carson City, Nevada 89710**

**THIS PAGE IS AN  
OVERSIZED DRAWING OR  
FIGURE,  
THAT CAN BE VIEWED AT THE  
RECORD TITLED:**

**"PROPOSED DOE REPOSITORY SITE  
YUCCA MT., NV. "**

**WITHIN THIS PACKAGE**

**NOTE: Because of these page's large file size, it may be more convenient to copy the file to a local drive and use the Imaging (Wang) viewer, which can be accessed from the Programs/Accessories menu.**

**D-01**