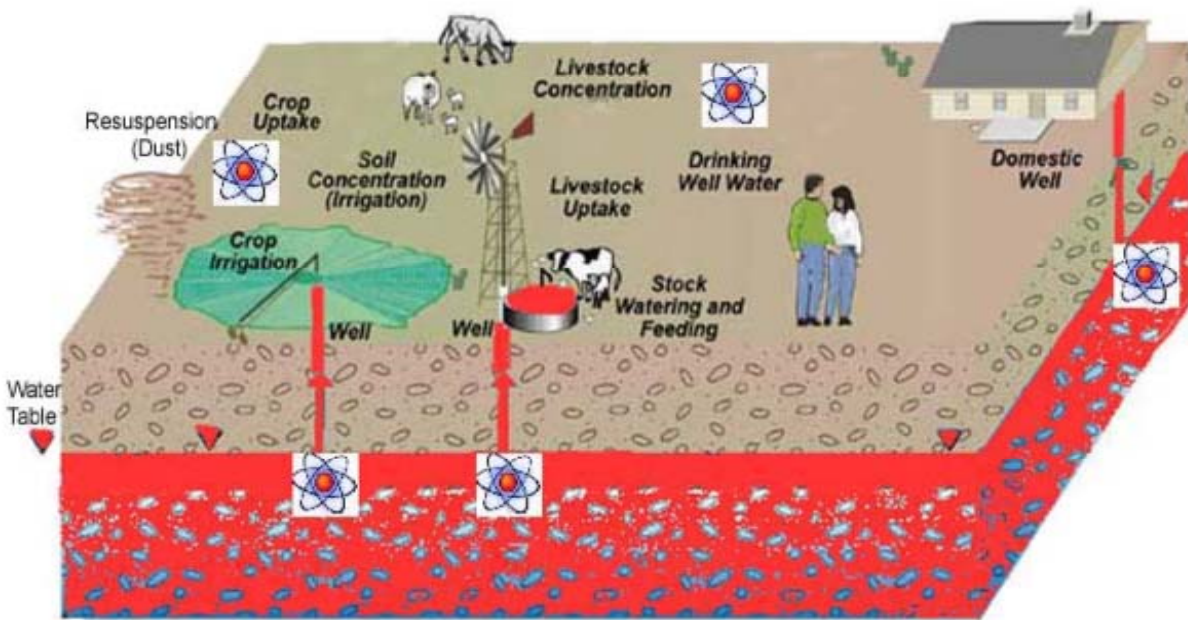


What's Wrong With Putting Nuclear Waste in Yucca Mountain?



**THE AGENCY FOR NUCLEAR PROJECTS
STATE OF NEVADA
2003**

THE FACTS

- When Congress passed nuclear waste laws in 1982, “geologic isolation” was required for any waste repository, to protect future generations. An isolation time of 250,000 years was envisioned, when radioactivity would have decayed to safe levels.
- This approach had been recommended by scientists since 1957, and was selected by Congress after a comprehensive 1980 study by the Department of Energy (“DOE”).
- Detailed safety rules for repositories were developed in the early 1980s by DOE, the Environmental Protection Agency (“EPA”) and the Nuclear Regulatory Commission (“NRC”), all based on geologic isolation.
- Hoping Yucca Mountain would satisfy this requirement, Congress selected it in 1987 as the only site for detailed study.
- But results from DOE studies were startling: They showed Yucca could not geologically isolate wastes, because water flows much faster from the surface through the mountain to the water table than had been expected.
 - *Yucca was formed from volcanic ash and is the only repository under consideration in the world that is above the water table, not below it.*
 - *Yucca’s volcanic material is brittle and contains innumerable fractures and voids, some resembling a Swiss-cheese formation.*
 - *DOE says the number of “water-conducting fractures” at Yucca is “on the order of one billion.”*
 - *Fast water paths through the mountain make “geologic containment” a matter of 50 to 200 years, not the 250,000 years intended by scientists and Congress.*
 - *The so-called “dry” rock is over 80% saturated with water, posing serious waste package corrosion risks.*

- *Yucca's rock form and chemistry are uniquely conducive to the production of strong acids that can corrode through metal waste packages.*
- *Scientists agree that the primary risk at Yucca is water transporting radioactive wastes from corroding waste containers to the accessible environment.*

BENDING THE RULES

- Knowing Yucca could never meet geologic isolation requirements in place since the 1980s, DOE contrived a new set of “rules” in late 2001 to enable the Secretary of Energy to declare the repository is suitable anyway.
 - *DOE now aims to satisfy all NRC licensing requirements merely by building “miracle metal” waste packages it claims will last for more than 10,000 years.*
 - *Instead of geologic isolation, the safety requirement now is that the mountain simply be able to “delay and dilute” contaminants released from corroding waste containers.*
 - *Instead of protecting all future generations, protection is now required only for the first 10,000 years.*
 - *DOE concedes radiation doses to humans near the site will vastly exceed safe limits after 10,000 years, when no protection is required.*
 - *DOE now wants Nevadans to trust its giant “computer model” of doses to the public from the Yucca septic field.*
- To help DOE license the inferior site, EPA radically re-drew the site boundary, so that releases would be measured where they can be diluted in local drinking water to meet radiation dose limits.
- NRC likewise removed its requirement for geologic isolation when it adopted a new licensing rule for Yucca Mountain in 2001.

- While bending the rules for Yucca, DOE, EPA and the NRC kept the stricter rules in place for any other repository ever to be built in America.
 - *Rapid groundwater travel times would have disqualified Yucca Mountain under both the previous DOE siting regulations and the previous NRC licensing rules for Yucca Mountain.*
 - *At the operating “WIPP” repository in New Mexico, by comparison, geologic isolation was so overwhelmingly demonstrated that waste packages were unimportant to the project’s safety analysis.*

THE NRC LICENSE PROCEEDING

- Nevada’s studies show the repository won’t come close to meeting even the new, lax safety rules, even during the first 10,000 years.
- DOE says it will file a license application at the NRC in December 2004. This begins a three- to four-year legal contest in which DOE bears the burden to demonstrate repository safety.
- Nevada has engaged a world-class team of scientists to work with Nevada’s attorneys. They will demonstrate that the repository fails safety tests at every single stage. (Federal law provides for these scientists be paid from the federal Nuclear Waste Fund.)
- To get a license, DOE must show that water trickling through Yucca will not corrode containers for 10,000 years or, if corrosion does occur, that radioactive waste quantities reaching the accessible environment will not be enough to exceed EPA dose limits.

WATER FLOW FROM THE SURFACE

- Repository safety analysis begins with projected rainfall. DOE’s computer models ignore climate change impacts expected at Yucca as a result of global warming.

- DOE assumes an average annual rainfall that is spread out evenly during the year. DOE, therefore, assumes most of the water evaporates before penetrating the mountain.
- In fact, rainfall at Yucca occurs frequently as torrential storms, often resulting in flooding that penetrates the mountain through fractures and faults.
 - *Last July, flash flooding washed out roads DOE had built at Yucca. Yucca's surface is latticed with erosion features from such flooding.*

WATER FLOW THROUGH THE "UNSATURATED" ZONE

- Below Yucca's surface is volcanic rock DOE calls the "unsaturated" zone. The repository would be built in this zone, about 1000 feet beneath the mountain crest, and about 1000 feet above the water table.
- Because the volcanic material is porous and retains water in innumerable matrices and voids, 80% of the void space is actually filled with water, on average.
- DOE hopes to show that little or no water will make it through this zone and into the repository. However –
 - *DOE now estimates there are at least a billion fractures in the unsaturated rock, permitting fast water flow times of as little as 50 years .*
 - *High repository temperatures from radioactive decay of nuclear waste will release and mobilize water already trapped in rock voids. DOE has found trapped water deposits of up to a million gallons at Yucca Mountain.*

THE REPOSITORY'S WASTE PACKAGES

- Because water threatens to corrode the repository's ten thousand waste packages, DOE is now proposing to install titanium umbrellas, or "drip shields," over every one of them, at a cost of nearly \$10 billion.
- Even if drip shields were to prevent dripping onto the waste packages, they will not negate the underground tunnel's high humidity and corrosive environment. Nevada's corrosion experts have determined that dripping is unnecessary for waste package corrosion to occur in the repository's hot, humid and dusty environment.
- Fractured rock in tunnels that would house the waste packages pose risks to those packages, since small earthquakes, heat and other disturbances cause rockfalls. Rockfalls can damage waste packages and increase their susceptibility to corrosion.
 - *Rockfalls are such a problem at Yucca that DOE engineers were forced to erect complex steel lattices around tunnel ceilings to protect workers from injury.*
- Waste packages will be made from "Alloy-22," a new industrial metal that DOE claims will contain wastes for at least 10,000 years. The Nuclear Waste Technical Review Board ("TRB") recently concluded there is no scientific basis to believe Alloy-22 is capable of this task.
- Using the water composition DOE says will be present in the repository zone, Nevada's corrosion experts were able to demonstrate to NRC and the TRB that Alloy-22 began corroding in mere *hours* at expected repository temperatures.
 - *Nevada's studies also showed that heat and humidity at Yucca will create an environment for microbes to thrive. Microbes produce nitrates, which speed corrosion of metallic surfaces.*
 - *The titanium drip shields are also highly susceptible to corrosion in the expected Yucca underground environment, according to Nevada- and NRC-sponsored studies.*

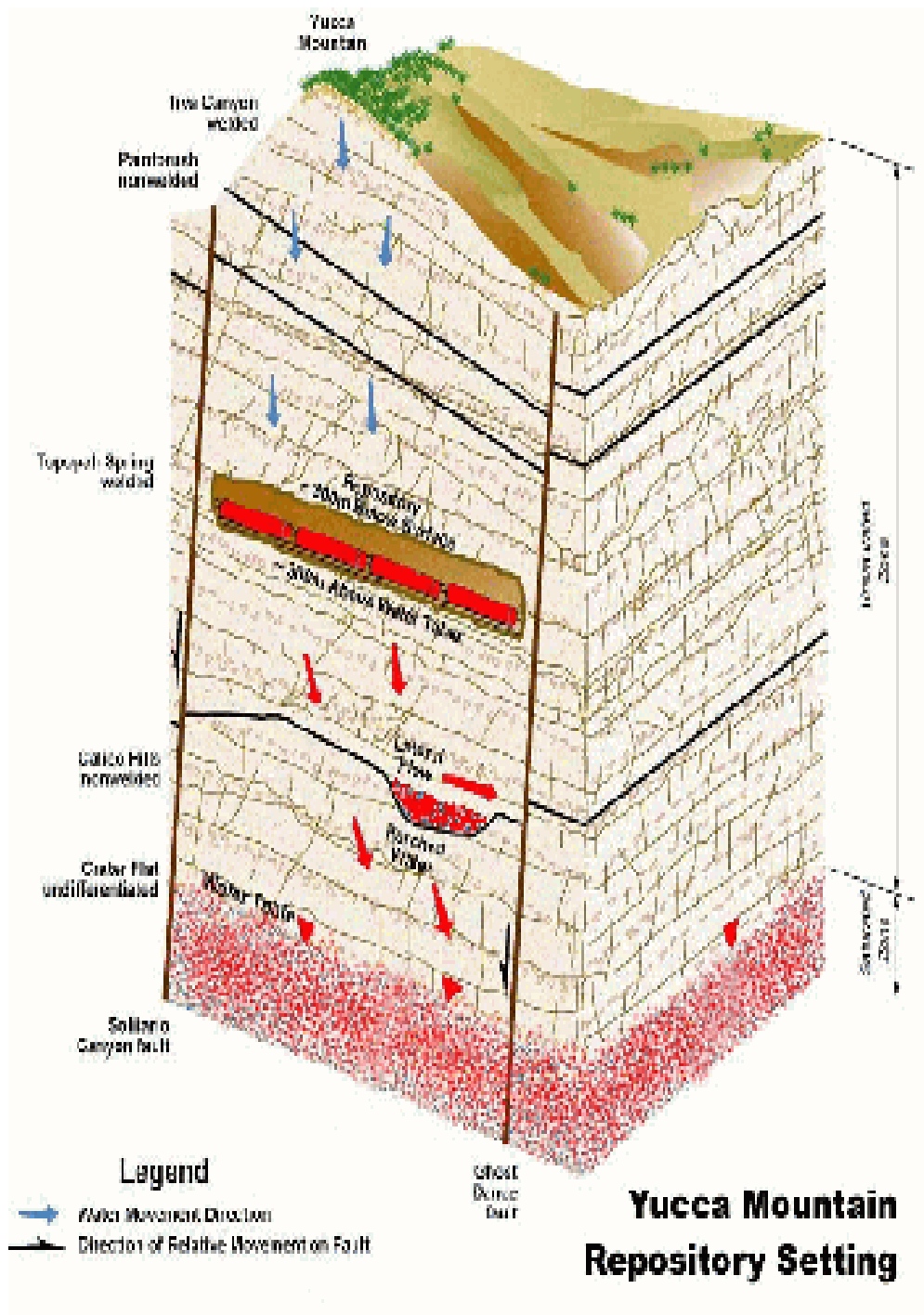
MIGRATION OF WASTE DOWN TO THE WATER TABLE

- DOE has assumed that a broad variety of radioisotopes released from corroding waste packages will not descend through the mountain to the water table, claiming they will be retarded by attaching to minerals in the rock, or by diffusing into the rock.
- But Nevada's studies show this phenomenon is not significant for many of the most prevalent radioactive constituents.
- Once radioactive materials get to the water table, DOE concedes they will rapidly migrate to Armargosa Valley (in as little as 100 years). Armargosa Valley today hosts Nevada's largest dairy and organic milk producer, using locally grown feed. It's about 80 miles north of Las Vegas, the nation's fastest growing city.

THE BOTTOM LINE

- DOE's performance models *assume* Nevadans will one day be drinking and using water contaminated with nuclear waste; the only questions being "how soon" and "how much." The Yucca Mountain high-level waste repository fails the tests of science and can never be made safe.

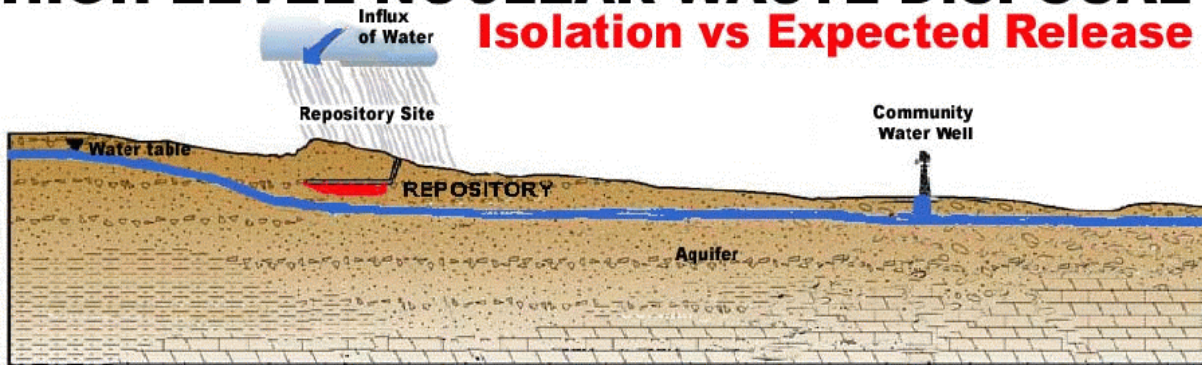
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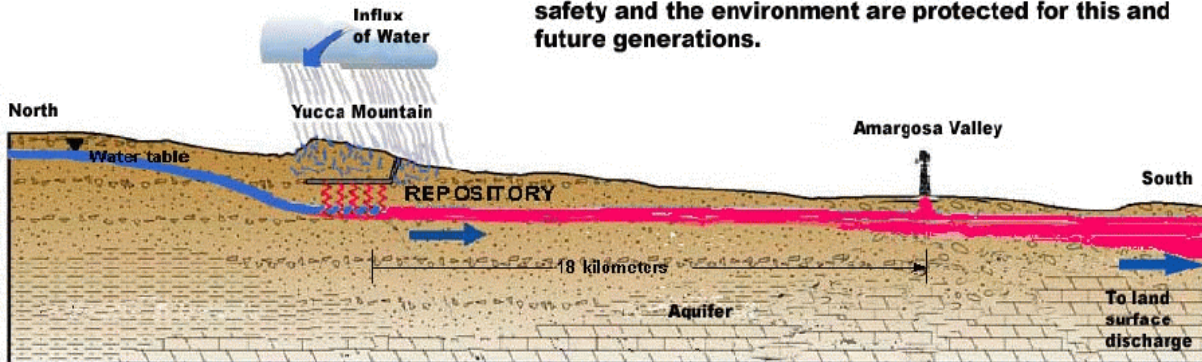
THIS IS WHAT YUCCA MOUNTAIN
WAS SUPPOSED TO LOOK LIKE



HIGH-LEVEL NUCLEAR WASTE DISPOSAL
Isolation vs Expected Release



DEEP GEOLOGIC DISPOSAL - Would isolate the radioactive wastes for a sufficiently long period of time to ensure that public health and safety and the environment are protected for this and future generations.



**YUCCA MOUNTAIN MINED GEOLOGIC
DISPOSAL SYSTEM CONCEPT**

- 1) Degradation and failure of the waste canisters through corrosion by water influx
- 2) Release of radionuclides from the waste packages into the host rock
- 3) Migration of radionuclides to the water table and aquifer
- 4) Flow of contaminated groundwater to wells used for drinking and agricultural purposes
- 5) Final discharge to land surface through playas and springs in Amargosa Valley and Death Valley



THIS IS WHAT YUCCA MOUNTAIN
ACTUALLY LOOKS LIKE