

**Testimony of Joan Claybrook
President, Public Citizen**

Yucca Mountain: The Hazards of Nuclear Waste Storage and Transportation

**The U.S. House of Representatives, Committee on Energy and Commerce
Subcommittee on Energy and Air Quality**

April 18, 2002

Washington, D.C.

Mr. Chairman and Members of the Subcommittee:

Thank you for the opportunity to testify on the president's February 14th recommendation that a nuclear waste repository be developed at Yucca Mountain, Nevada. I am President of Public Citizen, a national non-profit public interest organization with 150,000 members nationwide. Public Citizen works to protect citizens and the environment from the dangers posed by nuclear power and advocates for safe, affordable, and sustainable energy policies.

In the coming months, Congress will face an unprecedented decision about whether to support or override the Governor of Nevada's Notice of Disapproval to prevent establishing a Yucca Mountain repository for 70,000 metric tons of high-level radioactive waste from commercial nuclear power plants and Department of Energy (DOE) weapons activities.

Public Citizen urges the Committee to decisively reject Energy Secretary Spencer Abraham's unscientific site recommendation, support the Notice of Disapproval and stop the Yucca Mountain Project, in order to protect public health and safety. The DOE has a long record of investing in wasteful ventures and white elephants at a cost of tens of billions of dollars to the U.S. taxpayer. No private business could survive operating with such a string of misjudgments and failures. It is time for the Congress to insert a dose of reality and pull the plug on the hazardous Yucca Mountain venture. Just look at the DOE's mishandling of military nuclear waste projects, some of which were highlighted by *60 Minutes* on Sunday, March 17, 2002 (transcript attached). Yucca Mountain is poised to become another contaminated DOE site if the repository proposal moves forward.

The site is unsuitable

After fifteen years of site characterization studies at a cost exceeding \$5 billion, DOE scientists have been unable to demonstrate that a repository at Yucca Mountain could effectively isolate high-level nuclear waste throughout the quarter million years it remains dangerously radioactive. Having originally instructed the DOE to assess the suitability of the site for a geologic repository, Congress should now consider this question answered in the negative, and terminate repository activities at Yucca Mountain.

The geology of the site is ill-suited to the task of containment. Yucca Mountain is a ridge of porous volcanic tuff, highly fractured as a result of seismic activity. Thirty-three earthquake faults are known to exist within and adjacent to the Yucca Mountain site, with additional fault lines expected to develop over time. The proposed repository would lie about 1,000 feet above a freshwater aquifer, which currently provides the only source of drinking water for area residents in Amargosa Valley, Nevada, and parts of Inyo County, California. If radioactivity from the proposed repository reaches the aquifer below, it not only will contaminate this important source of drinking water, which is in short supply, but also will provide a pathway for potentially dangerous levels of radioactivity to reach the accessible environment.

Although the climate at Yucca Mountain is generally dry, evidence points to relatively rapid movement of water through the rock. Elevated levels of the tracer isotope Chlorine-36 found in the DOE's test tunnel at Yucca Mountain indicate that water traveled from surface- to repository-level (about 1,000 feet) in 50 years or faster. The original siting guidelines (10 CFR 960) would have disqualified the Yucca Mountain site on the basis of water flow time alone.

To prevent the site from being disqualified, the government changed the rules. The DOE inappropriately rewrote the repository siting guidelines in November 2001 to accommodate the deficiencies in the Yucca Mountain site. The revised guidelines (10 CFR 963) are a dangerous departure from the concept of geologic containment and offer an inadequate basis for site recommendation. The new performance-based siting guidelines permit a reliance on "engineered barriers" in an attempt to mask the many problems that should disqualify the Yucca Mountain site. DOE's repository design proposals rely more than 99% on engineered barriers for containment. The geology of Yucca Mountain contributes less than 1%.¹

Given the difficulties in accurately predicting, on the basis of very limited experience, the performance of engineered barriers over tens of thousands of years, coupled with the inadequacies of the "natural barriers" at Yucca Mountain, it is only a question of *when* – not *if* – the proposed repository's isolation systems would fail.

High-level nuclear waste is intensely radioactive and very long-lived. It is one of the most hazardous substances ever created. The waste's dangerous radioactivity will outlast any engineered barriers employed at Yucca Mountain. The Environmental Protection Agency's (EPA) site-specific radiation protection standards for Yucca Mountain (40 CFR 197) arbitrarily established a 10,000-year limit on containment requirements at the repository, which has been subsequently adopted by the DOE in its siting guidelines and the Nuclear Regulatory Commission (NRC) in its Yucca Mountain licensing rule.

¹ Nevada Nuclear Waste Project Office analysis of DOE presentation to Nuclear Waste Technical Review Board, 1/25/99.

Yet high-level nuclear waste will remain dangerously radioactive for much longer. For example, Plutonium-239, which accounts for approximately 1-4% of high-level nuclear waste by weight, has a half-life of 24,400 years and remains dangerously radioactive for close to a quarter-million years. If DOE's optimistic predictions are correct and the underground nuclear waste storage containers at Yucca Mountain do not begin failing from corrosion for 40,000 years, peak radiation dose rates from the proposed repository are expected 100,000-200,000 years into the future – outside EPA's inadequate regulatory timeframe.

The EPA's radiation standards (40 CFR 197) also establish a lower level of environmental protection for Yucca Mountain than the generic rule applicable elsewhere, by expanding the unregulated zone to 18 kilometers from the repository boundary. This site-specific rule allows the DOE to rely on dilution and dispersion in groundwater, rather than containment of radioactivity, and as such sets an inadequate benchmark for performance assessment evaluations. Public Citizen, together with the Natural Resources Defense Council and other environmental and public interest organizations, filed a lawsuit last June challenging these aspects of the EPA rule.

But even projections of the proposed repository's compliance with this inadequate standard are inconclusive. The Nuclear Waste Technical Review Board² advised Congress on January 24, 2002, that "the technical basis for the DOE's repository performance estimates is weak to moderate." Also, a December 2001 report by the General Accounting Office highlighted 293 unresolved technical issues, identified by the Nuclear Regulatory Commission, that require further study and analysis.³ As the GAO report suggests, Secretary Abraham's site recommendation is premature at best.

The risks of nuclear waste transportation cannot be justified

² The presidential-appointed Nuclear Waste Technical Review Board is an independent agency of the U.S. Government. The Board provides independent scientific and technical oversight of the civilian high-level radioactive waste management program.

³ *Nuclear Waste: Technical, Cost and Schedule Uncertainties of the Yucca Mountain Project* (December 2001).

Intrinsic to any assessment of Yucca Mountain's suitability as a national nuclear waste repository is the feasibility of transporting waste to the site. Yet the DOE has consistently downplayed the transportation impacts of the Yucca Mountain proposal. Secretary Abraham's site recommendation does not detail a specific plan for transporting waste from the 77 nuclear power plants and DOE weapons sites across the country where it's currently stored to Nevada. Basic decisions about the mode of transportation (truck, train, or barge) and routes have not yet been made.

The maps of *potential* Yucca Mountain transport routes, included in the project's final Environmental Impact Statement, indicate that tens of thousands of high-level radioactive waste shipments would likely pass through 44 states and the District of Columbia en route to Yucca Mountain. Recognizing the explosive nature of route designations, the DOE refuses to announce a specific proposal for transporting nuclear waste until after Yucca Mountain is licensed. But based on the Environmental Impact Statement, I have attached a list of members of this committee through whose districts high-level nuclear waste likely will be transported in route to Yucca Mountain. We urge the full committee not to vote on the Yucca Mountain Project until DOE reveals precisely which routes would be used for nuclear waste transportation.

Transporting nuclear waste is inherently dangerous because it increases the likelihood of radioactive release and introduces this risk to densely populated areas where the emergency response/public health infrastructure may lack the capacity to respond effectively to a nuclear emergency. The Department of Transportation (DOT) recorded 453,000 crashes involving large trucks in 1999, the most recent year for which statistics are available, including 8,857 hazardous materials shipments.⁴ Over the same period, the Federal Railroad Administration reported 2,768 train crashes.⁵ According to RailWatch analysis of accident reports, a train carrying hazardous materials in the U.S. runs off the

⁴ *Large Truck Crash Facts, 1999*, Analysis Division, Federal Motor Carrier Safety Administration, U.S. Department of Transportation (April 2001).

⁵ Federal Railroad Administration Office of Safety, <http://safetydata.fra.dot.gov/officeofsafety/>, viewed 3/16/02.

tracks, spills some of its load, and forces an evacuation about once every two weeks.⁶

Since the dawn of the Nuclear Age, approximately 3,000 shipments of high-level nuclear waste have traveled on U.S. roads and rails. This number would be exceeded within the first two years of shipments to the proposed Yucca Mountain repository. While the nuclear industry frequently refers to an accident-free shipping history, a 1996 analysis of DOE accident reports⁷ documents 72 “incidents” since 1949 involving nuclear waste shipments, including four involving “accidental radioactive material contamination beyond the vehicle,” four with radiation contamination confined to the vehicle, 49 of accidental container surface contamination, 13 traffic accidents with no release or contamination, and 2 incidents with no description. Extrapolating on the basis of this past history and considering, statistically, general traffic crash rates along probable nuclear waste transportation routes, crashes involving Yucca Mountain shipments are certain to occur if the repository program moves forward.

Given the statistical certainty of crashes involving Yucca Mountain nuclear waste shipments, the DOE and nuclear industry safety assurances rest upon the robustness of shipping containers, or “casks,” and their ability to contain radioactivity even in the event of a crash. However, we are concerned that in the event of a severe crash, casks may not perform as expected. DOE accident analyses fail to consider the statistical likelihood of manufacturing and human error and its impact on cask performance. Also, NRC license requirements for high-level radioactive waste transport casks rely on computer modeling. Amazingly, currently licensed casks have never had full-scale, dynamic tests. Limited dynamic tests in the 1970s were performed on now-obsolete casks and have not been repeated. In those tests, cask valves and shielding failed during extended fire tests.

Furthermore, the NRC’s performance requirements for nuclear waste casks (10 CFR 71.73), established in the 1970s, are outdated and dangerously underestimate the conditions of today’s worst-case accident scenario:

⁶ *Why Is There a Train Accident Every 90 Minutes?* RailWatch (revised March 1999).

⁷ *Reported Incidents Involving Spent Nuclear Fuel Shipments, 1949 to Present*, Nevada Nuclear Waste Project Office (1996).

- The drop test requires casks to withstand a fall from 30 feet onto an unyielding surface, which simulates a crash at 30 miles per hour. Yet no regulations are in place to limit to 30 mph the speed at which nuclear waste shipments can travel. This test condition could easily be exceeded, if, for instance, a cask traveling at regular highway speeds (now 65-75 miles per hour) crashed into oncoming traffic or a virtually unyielding structure such as a bridge abutment.
- The burn test requires casks to withstand an engulfing fire at 1475 degrees Fahrenheit for 30 minutes. Other materials routinely transported on our roads and rails could spark a hotter fire (diesel burns at 1850 degrees) and could potentially burn for longer than half an hour. Last summer's fire in Baltimore's Howard Street train tunnel – which the DOE has identified as a potential Yucca Mountain shipment route - burned for more than 3 days and likely reached temperatures of at least 1500 degrees. If a nuclear waste cask had been on the train involved in that accident, its containment would have been breached, exposing 345,493 people in the area to radiation and costing at least \$13.7 billion dollars to clean up.⁸
- The puncture test requires casks to withstand a free-fall from 40 inches onto an 8 inch-long spike. A train derailment or a truck crash on a bridge could result in a fall from much higher than 40 inches and potentially result in puncture damage to the cask's shielding.
- The same cask is required to withstand submersion in 3 feet of water, and a separate test requires an undamaged cask to withstand submersion in 200 meters of water (656 feet) for 1 hour. If a crash involving a nuclear waste shipment occurred on a bridge or barge, a damaged cask could be submerged in depths greater than 3 feet. Furthermore, given the weight of nuclear waste transport casks, it is not reasonable to assume that a submerged cask could be rescued within one hour. Licensed truck casks weigh 24-27 tons, loaded, and train casks can weigh up to 125 tons, loaded. In the case of a barge transport accident, if a crane capable of lifting such a massive load out of the ocean were not immediately available, water pressure over longer periods could result in cask failure and radiation release.

⁸ *Radiological Consequences Of Severe Rail Accident Involving Spent Nuclear Fuel Shipments To Yucca Mountain: Hypothetical Baltimore Rail Tunnel Fire Involving SNF*, Radioactive Waste Management Associates (September 2001).

The prospect of transporting high-level nuclear waste across the country through major population centers also poses a security risk, particularly in the current context of heightened national security concerns. Immediately following the September 11th terrorist attacks, at least 10 people were arrested on charges of possessing fraudulent permits for transporting radioactive and hazardous materials.

Regulatory requirements are also inadequate to protect against the risk of terrorist attacks. Although the Nuclear Regulatory Commission does not require transportation casks to be tested against this vulnerability, tests and studies have demonstrated that an anti-tank weapon could easily penetrate a nuclear waste transportation cask and result in a potentially catastrophic release of radiation. In a 1998 demonstration at Aberdeen Proving Ground, a TOW anti-tank missile shot at a Castor V-21 storage cask blew a hole through the wall of the cask. Analysis by the state of Nevada indicates that a successful terrorist attack on a GA-4 truck cask using a common military demolition device could cause 300 to 1,800 latent cancer fatalities, assuming 90% penetration by a single blast. Full perforation of the cask, likely to occur in an attack involving a state-of-the art anti-tank weapon such as the TOW missile, could cause 3,000 to 18,000 latent cancer fatalities. Cleanup and recovery costs would exceed \$17 billion.⁹

Yet just last month, on March 11, 2002, CIA national intelligence officer Robert Walpole told the Senate Government Affairs Committee that while the chance that a missile with a nuclear, chemical, or biological warhead will be used against U.S. forces or interests is greater today than during most of the Cold War, the agency's analysts believe there is an even greater threat that such a weapon will be delivered by truck, ship or airplane "because non-missile delivery means are less costly, easier to acquire, more reliable and accurate".¹⁰

⁹ "Potential Consequences of a Successful Sabotage Attack on a Spent Fuel Shipping Container: An Analysis of the Yucca Mountain EIS Treatment of Sabotage," Radioactive Waste Management Associates, April 2002.

¹⁰ The Boston Globe March 12, 2002 and The Milwaukee Journal Sentinel March 12, 2002 quoting the Associated Press.

On September 11, 2001, and again in October when U.S. forces entered Afghanistan, Secretary Abraham suspended all nuclear shipments because of the security risks they pose. Yet his Yucca Mountain site recommendation, issued only 5 months later, failed to acknowledge or address this security concern in relation to the tens of thousands of nuclear shipments that would be launched by the Yucca Mountain Project.

The unintentional and non-accident risk of nuclear waste transportation is also a concern. NRC regulations allow nuclear waste shipping casks to emit 10 millirem of radiation – the equivalent of a chest X-ray – per hour from a distance of 6.5 feet. The cumulative impact of routine radiation exposure from Yucca Mountain nuclear waste shipments on other motorists (maximized in gridlock traffic scenarios) and people who live or work along transport routes has not been adequately examined.

The multiple risks associated with transporting large volumes of nuclear waste over long distances to an unsuitably sited repository in Nevada simply cannot be justified. Since a repository at Yucca Mountain necessarily involves an unprecedented program of nuclear transportation, we urge the Committee to fully consider the impact of the many transportation dangers in its evaluation of the Yucca Mountain Site Recommendation.

The integrity of the process has been undermined

The dramatically flawed process railroading the Yucca Mountain Project toward approval undermines the credibility of Secretary Abraham's site recommendation. The downgrading of environmental regulations (EPA's more lenient site-specific radiation protection standards and DOE's revised siting guidelines that prevent Yucca Mountain from being disqualified) has set a dangerous precedent of sacrificing public health and environmental safety to nuclear industry interests. And yet even these underhanded decisions cannot mask the fact that this site is not suitable, as the GAO, IG, and Nuclear Waste Technical Review Board have made clear.

A Public Citizen report released April 1, 2002, indicates that nuclear industry interests may have directly biased Secretary Abraham's site recommendation. The report is attached. According to our research, the nuclear industry contributed \$82,728 to Secretary Abraham's failed bid for re-election during the 2000 election cycle, and in 2000 alone, top nuclear contributors to his campaign spent more than \$25 million – nearly half a million dollars each week – on lobbying efforts that included support for the repository proposal. Public Citizen, in January 2002, requested that Secretary Abraham recuse himself from Yucca Mountain site recommendation activities, based on the precedent of Attorney General John Ashcroft recusing himself from the Justice Department's Enron investigations because the failed energy trading company had contributed \$75,000 to his election campaign. Our letter to Secretary Abraham is attached. We have received a legalistic response that doesn't deal with the issue of the appearance of impropriety.

As another indication of pro-industry bias in the Yucca Mountain Project, a November 2001 report by the DOE Inspector General disclosed that the law firm Winston & Strawn was simultaneously employed as counsel to the DOE, working on the Yucca Mountain Project, and registered as a member of and lobbyist for the Nuclear Energy Institute between 1992 and 2001. The executive summary of this report is attached. The DOE, as a federal agency, is supposed to be objective and unbiased in its evaluations of the repository proposal and to uphold the same standards of integrity for its contractors. Yet it hired a member of the Nuclear Energy Institute, the lobbying arm of the nuclear industry that specifically advocates in favor of the proposed nuclear waste repository at Yucca Mountain, which would serve the narrow financial interests of its nuclear industry members. The involvement of Winston & Strawn lawyers in both shaping the DOE's Yucca Mountain activities and advising and lobbying on behalf of the Nuclear Energy Institute on nuclear waste legislation undermines the integrity of the recent site recommendation. After this conflict was publicly disclosed, Winston & Strawn resigned from the Yucca Mountain Project. But even in the wake of this scandal, but the firm's work was not withdrawn.

The same Inspector General report notes that TRW, Inc., hired by the DOE as the managing and operations contractor for the Yucca Mountain Project until February 2001, was simultaneously engaged in lobbying activities on nuclear waste storage issues. TRW was additionally implicated in December 2000 as the author of a memo attached to a leaked overview of the DOE Yucca Mountain Site Recommendation Considerations Report (later released as the Preliminary Site Suitability Evaluation and the Science and Engineering Report). The memo indicated that the overview was intended to help supporters of the Yucca Mountain Project express their support for a favorable site recommendation and that “the technical suitability of the site is less of a concern to Congress than the broader issue of whether the nuclear waste problem can be solved at an affordable price in both financial and political terms.”

Clearly, the DOE has failed to exercise necessary and proper oversight of its contractors, resulting in an obvious pro-industry bias in the agency’s site characterization and site recommendation activities. In January, Public Citizen joined 232 public interest and environmental groups calling on Congress to suspend consideration of the Yucca Mountain Project pending a thorough review of the causes and consequences of contractor conflict of interest in the DOE’s site characterization and site recommendation activities. This letter is attached. The public cannot – and lawmakers ought not – have confidence in Secretary Abraham’s site recommendation, which has arisen out of such a conflicted and compromised process.

Conclusion

The 1957 National Research Council report, commissioned by the Atomic Energy Commission and which marked the beginning of this government's continuing process to identify "disposal" options for high-level nuclear waste, stated in its summary, "Unlike the disposal of any other type of waste, the hazard related to radioactive waste is so great that no element of doubt should be allowed to exist regarding safety."¹¹ Numerous unresolved technical, environmental, and policy issues plague the Yucca Mountain Project. To approve the repository proposal would directly threaten the health and safety of current and future residents of Nevada and more than 50 million people who live along likely nuclear waste transportation routes. Furthermore, the failed Yucca Mountain Project serves as a distraction from the serious policy examination and scientific study that is needed to more appropriately address the increasingly urgent issue of high-level nuclear waste management.

We recommend that:

- the Committee uphold Nevada's anticipated Notice of Disapproval of the Yucca Mountain Project and reject any siting approval resolution;
- the Committee hold additional hearings in all major cities along nuclear waste transportation routes identified in the final Environmental Impact Statement for the Yucca Mountain Project to give the public a voice in this decision;
- Congress and its Committees maintain vigorous legislative oversight of the nuclear waste transportation program that accompanies any repository proposal; and
- Congress initiate a complete review of the civilian nuclear waste management program.

¹¹ *The Disposal of Radioactive Waste on Land*, National Research Council (1957).