

Yucca Mountain Should Be a Non-Issue In Today's Nuclear Renaissance

by Jim Muckerheide

Yucca Mountain has been shrouded in a political fog since its designation by Congress 20 years ago as the site to be studied as a repository for spent nuclear fuel. Two important facts that have not penetrated the public through this fog are: (1) Spent nuclear fuel is not "waste." It is 97 percent recyclable as nuclear fuel. (2) Radioactivity from spent fuel is not a significant hazard.

Today, as the world enters a nuclear renaissance, the United States must not sacrifice the need to build a substantial fleet of new U.S. nuclear plants to a 20-year-old error in designating spent nuclear fuel as "waste" to be buried. Nor should the nation be left to twist on the false premise that radioactivity from spent fuel and/or high level waste constitutes a significant hazard.

Radiation doses from realistic evaluations of the release of radioactivity in spent fuel or high-level waste do not pose a risk, especially when compared to the management of truly hazardous chemical and biological waste materials. Potential dispersal of this radioactivity can, at worst, produce concentrations in the biosphere that are trivial compared to naturally occurring radioactivity, which is not a hazard.

Here are highlights of Yucca Mountain history and some of the mistakes that were made (and are still being made) by the nuclear industry, the Department of Energy and its predecessors, and the Congress. Building new nuclear plants must not wait for Yucca Mountain to be operational; spent fuel can be stored safely in dry casks on or off site, and recycled into new fuel. Only small amounts of solidified wastes may require long-term disposal, if useful fission-product isotopes are recovered, and long-lived transuranics are "burned" using fast-neutron reactors.

Yucca Mountain is in Nevada, about 90 miles northwest of Las Vegas. It is the



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Yucca Mountain, Nevada, was selected 20 years ago as a burial site for spent nuclear fuel, which is not "waste" and should be recycled, not buried.

sole high-level radioactive waste repository site designated for DOE study by Congress in 1987. The site is adjacent to the Nevada Test Site, where nuclear weapons were detonated above ground until 1962, and below ground until 1992.

Geologic disposal was studied since the 1960s by the Atomic Energy Commission; its 1974 replacement, the Energy Research and Development Administration; and by ERDA's 1977 replacement, the Department of Energy (DOE).

From the beginning of the Atoms for Peace program of the late 1950s and 1960s, nuclear fuel was to be reprocessed to recover the 97 percent uranium and plutonium, leaving the 3 percent that consists primarily of fission products plus some contamination by long-lived uranium, plutonium, and other transuranic elements. These were

to be solidified to a glass or other leach-resistant form. (This 3 percent of high-level waste can be mined for its valuable isotopes which can be used for medical, industrial, energy, and other purposes.)

A Series of Errors

Legislative proposals and hearings in the late 1970s produced the 1982 Waste Policy Act requiring disposal in geologic repositories. The DOE was to conduct a siting study to select the best locations in various geologic media, to work with the states for the siting studies. A Nuclear Waste Fund was established to receive one tenth of a cent per kilowatt-hour from every nuclear utility for nuclear-generated electricity. This fund has collected more than \$28 billion in contributions plus interest, with a little more than \$9 billion expended on Yucca Mountain.

Following the 1982 Act, DOE conducted a disastrous siting study, produc-

ing very costly plans for site screening, and working with states in backrooms instead of in public view. Several states ejected the DOE, including Tennessee, the home of Oak Ridge National Laboratory, and New Hampshire, the home of the then pro-nuclear engineer-governor, John Sununu, who could not defend DOE's secret granite investigations. States memorialized Congressional delegations to prevent DOE from investigating state sites.

Unfortunately, the nuclear industry did not object to DOE's assured destruction of the repository siting program. The 1982 legislation and DOE's implementation needed corrective action, which came in the 1987 Amendments. However, because of DOE's enormous costs to screen sites, Congress decided that DOE should study only one site for suitability; after that, another site might be studied. Other sites were in Louisiana, Texas, and Washington.

Granite site studies (in the upper Midwest and Northeast) were to be deferred to the next repository. So, Congress designated Nevada's Yucca Mountain site as the one site to be studied, in what is known in the state as the "screw Nevada" bill.

Nevada had long experience with the Atomic Energy Commission Nevada Test Site. Association with mushroom clouds and earth shaking had once been tourist attractions. In this new Congressional plan, spent fuel was to be carefully emplaced in the earth, to join radioactivity from hundreds of nuclear explosions, that were not so carefully placed in the earth. Yucca Mountain was also very remote from Las Vegas, adjacent to and beyond the Nevada Test Site and enormous military sites.

However, nonsensical political decisions severely contaminated the program. Interim storage of spent fuel was precluded on the misbegotten idea that "such storage would reduce the 'urgency' to select and license a repository." Yet, in a ludicrous objective to meet the time limits to move fuel from operating plants before many spent fuel pools were full (which the industry falsely argued would cause plants to shut down), DOE was directed to take the fuel by 1998. However, DOE and the Nuclear Regulatory Commission (NRC) were also directed to license the

Repository for permanent disposal before spent fuel could be loaded in the repository, even though the spent fuel was to be retrievable for a long time, both for unforeseen repository problems, and because spent fuel has the enormous fuel value (mentioned above) that could be needed in the future.

Industry Failures

The Nuclear Energy Institute (NEI) and its industry-lobby predecessors have been primarily committed to support the operating nuclear power plants, not to consider building more plants. On spent fuel and waste disposal, they tried the impossible: to push DOE to meet the 1987 Congressional mandate for DOE to license the site as a repository to take spent fuel for disposal by 1998. Obviously the industry leaders never considered any realistic schedules or they would have been in Congress trying to fix these and other problems that made the program impossible.

When this schedule was finally recognized as impossible, the utilities continued to be pushed by their state regulators (because the ratepayers actually feed the Nuclear Waste Fund), and they fruitlessly continued to push DOE to open Yucca Mountain as soon as possi-

ble. Their false mantra was that all it takes is "political will" and that the DOE had to avoid causing premature plant shutdown (due to loss of spent fuel pool storage space). The industry itself even falsely claimed that dry storage casks at plants were a hazard that the public should reject—exactly the position of many anti-nuclear fear-mongers!

Industry leaders did not adequately consider the nature and magnitude of the 1970s problems indicated by the Atomic Energy Commission experience, the Energy Research and Development Administration, and the DOE in high-level waste siting. The industry also did not adequately consider DOE's failures in implementing the 1982 Waste Policy Act, and initial problems following the 1987 amendments.

Further, industry leaders did not adequately consider the geologic principles and constraints of disposing of spent fuel instead of solidified wastes, nor especially the consequences of disposing of hot fuel instead of providing for long-term cooling before placement. Nor did they consider the realities of examining and characterizing Yucca Mountain geology. Therefore, industry leaders did not take appropriate and effective posi-



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Excavation of one of seven alcoves in the main tunnel of Yucca Mountain, to investigate the mountain's geologic features. The nuclear renaissance in the United States does not have to wait for Yucca Mountain to be operational.



tions with the DOE or Congress to avoid problematic conditions imposed on, and adopted by, DOE, or to adequately act in their own best interests.

Reevaluation Necessary

Today, however, there are substantial changes in national policy and program conditions, especially the renewed interest in—actually, the necessity of—building new nuclear power plants. Spent fuel management strategy must be revised accordingly.

The problem: Yucca Mountain is not imminently available, and it could be a problem if it were available. Yucca Mountain is now, again, delayed, with a new DOE schedule to submit a license application to the NRC in 2008, and an optimistic schedule to open the repository in 2017.

However, if NRC licensing were just now completed, and transportation of spent fuel started, it would be an anti-nuclear target for the radiation hysteria that is being fostered by the Federal agencies, the industry, and the media. Lawsuits would also go after many political targets of opportunity, over many years, whether ultimately successful or not.

In addition, this DOE/NRC decision would also approve a repository that is

not large enough to dispose of the spent fuel that is already committed from the operating plants. Congressional authorization is only now being proposed to enlarge Yucca Mountain for the existing plants, to 120,000 tonnes. However, if Yucca Mountain is only large enough for the current plants with their extended lifetimes, and continues to be considered essential to build new plants, it begs the question of another repository for future plants.

Meanwhile, Yucca Mountain is delayed. This was most obviously caused by the Federal court finding that the Environmental Protection Agency (EPA) 15 mrem/yr total dose limit for 10,000 years, with 4 mrem/yr from a well water pathway, does not comply with the Congressional language which directed that the National Academy of Sciences (NAS) produce a report on the necessary standards. The NAS stated that the highest release would be after 100,000 years. EPA is therefore required to develop standards for releases beyond 10,000 years.

This poor Congressional and NAS language, which the industry did not adequately challenge at the time, reflects inaccurate information about radiation health effects, whereby the public and

politicians believe that insignificant radiation doses are hazardous. This false perception is fostered by the many bureaucracies and industry interests that profit from the expenditure of hundreds of billions of dollars from the public for radiation protection that is not actually necessary.

Yucca Mountain project credibility is low. It is affected by the well-publicized reports of the U.S. Geologic Survey misconduct in producing data. There are many such targets in the licensing proceedings and court cases, and more should be considered as likely.

There is also uncertainty about the construction of the proposed dedicated DOE railroad. Poor DOE performance, even in simply providing the documents for the proceeding, along with quality assurance and other issues, are targets. A cadre of geologists, as well as risk analysis experts and others, is prepared to support Nevada and anti-nuclear organizations.

It is uncertain whether DOE can file a repository license application in 2008 that the NRC will find acceptable. In any event, the licensing proceeding, as conceived, is potentially unmanageable. NRC licensing will likely entertain all technical and legal resources of the anti-nuclear organizations, plus Nevada, and possibly other states and organizations, to be followed by court cases.

There can be no confidence that DOE can conduct this proceeding with the best legal and administrative capacity; nor that such best capabilities are sufficient. This proceeding would more likely be reminiscent of the worst 1970s nuclear plant licensing proceedings.

Revise Spent Fuel Policy

Therefore, national policy on spent fuel management, waste disposal, and Yucca Mountain, needs to be revised. Ideally, the industry should aggressively work with the Administration and Congress to articulate the current, default, U.S. spent fuel storage and disposal conditions as a national policy. Such a policy should reflect the following considerations:

- Spent fuel can be safely stored for many decades in dry casks, whether at reactors or central locations. Spent fuel will be stored in dry casks pending future national decisions on the need to rely on nuclear power and, therefore to

recycle spent fuel.

- Recycling spent fuel, and processing the high-level waste, as now proposed under the Global Nuclear Energy Partnership, will greatly reduce fission product and transuranic radioactivity sources, especially with transmutation. This would eliminate most of the heat source and the potential releases that are the supposed challenge to Yucca Mountain disposal.

- As the nation (and the world) rely more on nuclear power, future decisions on the schedule to recycle spent fuel will eventually depend on uranium availability. Therefore, Yucca Mountain (or other repository) would then be designed to accommodate only the associated high-level waste from spent fuel recycle. The policy should provide that if, for some reason (such as the development of fusion or a more advanced energy source), nuclear power were not to be a critical energy source, the stored spent fuel could be disposed in Yucca Mountain (or other repository), but would then have had extended cooling and radioactive decay to substantially reduce the impact on the repository.

Taking Corrective Action

The nation, and the world, must build thousands of nuclear plants this century. Current plans for new plants should be considered as initial demonstration plants which will inform future political decisions on the appropriate long-term nuclear power commitments.

We need a clear and politically adopted National Policy to store spent fuel (primarily on-site) until Yucca Mountain use and design is resolved. To inform the public and politicians, a substantial record of the *lack of* hazard from the radioactivity in spent fuel and high-level waste should be produced in support of the policy. Senators Domenici (R-N.M.) and Reid (D-Nev.) should lead bipartisan support for such a constructive policy.

The Yucca Mountain proj-

ect must continue, but current nuclear power development requires deferral of its primary implementation. Licensing the repository for permanent disposal, should be pending future nuclear power and spent fuel treatment and disposal decisions. Placing existing solidified high-level waste into Yucca Mountain as tests for monitoring and retrieval, without artificial schedule deadlines, may be valuable.

Spent fuel in dry storage casks can be shown to be safe, secure, and monitored for decades, whether at or away from reactor sites, while the radioactivity is decaying, and decisions are being made on the location of fuel recycle facilities. The anti-nuclear groups concerned about the risk of on-site storage of spent fuel in pools pushed the NRC, the NAS, and the Congress, to support dry cask storage as the safer preferred alternative. That conclusion should be recognized in implementing the spent fuel and waste management policy.



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A dry storage cask for spent fuel at the Surry Nuclear Power Station in Virginia. Each dry cask is 16 feet high, 8 feet in diameter, and has 15-inch-thick walls made of steel. Each cask holds 21 to 24 spent fuel assemblies.

In this mode, the U.S. spent fuel and high-level waste management program will be generally consistent with the equivalent programs in most nuclear energy nations. In addition, the Yucca Mountain program schedule will not be a constraint to the construction of new nuclear power plants in the United States and elsewhere in the world.

Nuclear Industry Must Change

Since the 1980s, the industry has supported the primary interests and objectives of the current operating plants. However, there is now an imperative to build new nuclear power plants. This changes the initial conditions. A national policy interest transcends the short-term operating plant interests. The industry must *rather belatedly* prepare for new nuclear plants.

We must undertake an aggressive effort to address the need, and to develop strategic plans for, substantial nuclear energy facilities (for electric and non-electric power applications), demonstrating dry storage safety, with time to resolve future nuclear energy and reprocessing needs. Simultaneously, we must resolve the technical questions of Yucca Mountain (while the fuel is cooling), taking Yucca Mountain off of the critical path.

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