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Nevada and Trump administration face off over Yucca Mountain

The state perseveres in its three-decade-long fight against hosting a national nuclear waste repository as support for the project from the White House and Congress resurges.

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Thirty years ago in December, over Nevada's objections, the US Congress chose a scrubby ridge on federal land about 130 kilometers from the Las Vegas strip as the nation's underground repository for highly radioactive nuclear waste. After the expenditure of more than $10 billion to study the Yucca Mountain site's suitability, develop its design, and prepare for its licensing, the project has been moribund for eight years. The spent nuclear fuel that was destined for deposit there continues to pile up at the nation's nuclear power reactors.

The Department of Energy, which by law was to begin accepting the waste in 1998, has now paid out more than $6 billion in court-ordered judgments to nuclear plant operators for defaulting on its obligation. Those fines, meant to reimburse utilities for the cost of storing the spent fuel, continue to accrue, and DOE has estimated that the bill to taxpayers will climb to $29 billion by 2022.

Now President Trump has proposed undoing President Barack Obama's 2009 cancellation of Yucca Mountain. The White House has requested $150 million in fiscal year 2018 for DOE and the Nuclear Regulatory Commission (NRC) to restart the licensing process. Included in the $120 million DOE portion of the budget request is $10 million to begin planning for one or more interim storage sites, where spent fuel would be consolidated until a permanent repository is completed. The NRC would receive $30 million to continue the licensing procedure.

The Nevada government and congressional delegation have relentlessly opposed the repository since it was forced on the state. Senator Harry Reid (D), the majority leader in 2009, convinced Obama to halt the program. Governor Brian Sandoval (R) of Nevada has vowed to use every legal and regulatory tool available to block resumption. Four of the state's five congressional delegation members are unconditionally opposed to the repository; the other calls for the state to negotiate for better terms.

The NRC suspended its review of DOE's construction license application in 2011, after appropriations were halted. But a federal appeals court in 2013 ordered the commission to resume consideration. In 2015, using leftover appropriations, NRC staff completed their safety evaluation report. A year later, they issued a supplemental environmental impact statement on groundwater impacts; DOE had declined to prepare that statement. The NRC staff had two remaining issues before it could recommend granting a license: The state still needed to issue permits for the use of groundwater during construction and operations, and the US

Air Force and the Bureau of Land Management had to resolve ambiguous land ownership issues with DOE.

NO PATH FORWARD

Following Yucca Mountain's cancellation, DOE formed an advisory committee at Obama's request to help chart a new path for disposing of nuclear waste. In its 2012 report, the panel, known as the Blue Ribbon Commission on America's Nuclear Future, called for starting from scratch with a new siting process that would require the consent of states and other affected parties such as American Indian tribes. The commission also urged establishment of one or more interim storage facilities to house spent fuel until a repository is built. Two companies have applied for NRC licenses to operate such facilities, one site in west Texas and the other in southern New Mexico.

But little has come of the panel's recommendations concerning a new repository. The federal government has sole jurisdiction over high-level nuclear waste. Geoffrey Fettus, an attorney at the Natural Resources Defense Council, which opposes the Yucca Mountain project, says the commission failed to suggest how to obtain states' consent. The key, he says, is giving states a role in regulating the waste, just as they have had with other hazardous wastes. "You won't get consent if you keep federal preemption over the waste," he says.

If there's anything certain about Yucca Mountain, it's that construction is still many years away, even if the repository is ultimately approved. Nevada has filed 218 specific objections to the NRC's findings. It joins

other parties, including the nuclear industry and environmental groups, who have filed their own objections. Each must be adjudicated before the Atomic Safety and Licensing Board Panel, made up of independent administrative law judges. In a trial-like process, NRC and DOE staff will be deposed and then called as witnesses. That process is expected to take two to three years. Only then would the DOE license application go before the NRC commissioners, who are political appointees, for an up or down vote. Should the license be issued, the state will challenge it in court.

Other practical considerations will delay the licensing process. An April report from the Government Accountability Office notes that DOE and NRC both will need to reconstitute the expertise they lost when the project was halted. Bringing staff members up to speed once they are hired or transferred from other duties is likely to take a year, the report says. The 180 employees who had been working on Yucca Mountain at DOE were laid off in 2010, and contracts in support of the project with the national laboratories and other entities also were terminated. According to the GAO, years had been required for DOE to recruit and train the proper mix of scientists and engineers with the required backgrounds in hydrology, geology, mathematics, and other fields.

Robert Halstead, executive director of the Nevada governor's agency for nuclear projects, says the state has kept its entire team of experts and lawyers on throughout the licensing hiatus, and he expresses confidence that the state will defeat the project on technical grounds. "If Congress forces DOE to go forward with the Yucca Mountain repository concept on

which the current license application is based, I expect Nevada to defeat it. And DOE would be well advised to think about withdrawing their application for the purpose of radically changing it to address things Nevada has raised in its contentions," he says.

GROUNDWATER IS MAIN ISSUE

State officials object to the repository proposal on multiple grounds, including DOE's plans for transporting waste by rail and truck to the site, seismicity concerns, and even the possibility of fighter jets from the air force's adjacent Nevada Test and Training Range crashing onto surface operations. But Halstead says the issue on which the project ultimately will turn is whether potential radiological contamination of groundwater can be kept within regulatory limits for the next one million years.

Congress in 1992 instructed the Environmental Protection Agency to draft a groundwater radiation protection standard specific to Yucca Mountain. The EPA promulgated a two-part regulation that limits the dose received by a hypothetical person consuming two liters of groundwater daily at either of two locations downstream of the repository to no more than 15 millirems per year for the first 10 000 years, and to no more than 100 millirems per year for the subsequent 990 000 years. For comparison, the dose from a mammogram is about 13 millirems, and the average US annual background exposure is around 300 millirems.

Nevada has a court challenge, pending since 2009, objecting to the dual EPA standard. That suit, says Halstead, hinges on one question: If 15

millirems is the appropriate safety limit for the first 10 000 years, how can you increase it sixfold for the rest of the million years?

DOE did not respond to repeated requests for comment for this article. But the Nuclear Energy Institute (NEI), the industry's trade association, strongly supports the revival of Yucca Mountain. Rod McCullum, NEI's senior director for used fuel and decommissioning, maintains that Nevada's opposition is entirely political. The case for safety made by DOE and NRC staff, he says, "has a lot of science behind it; the Nevada contentions do not." Acknowledging that the repository "probably will be the most heavily litigated licensing process of all time," McCullum says he suspects nonetheless that Nevada will eventually stop the fight and negotiate with DOE to obtain greater economic benefits and a larger state role in ensuring safety during construction.

Representative Mark Amodei (R), who represents the northern portion of Nevada, advocates negotiation. He declined an interview request, but his website states his position that it's "likely the repository will eventually come to fruition through a sound scientific process over time." It also argues that Congress should work with DOE to make the location "a bastion of nuclear research and reprocessing" that would include a nuclear safety best-practices center, a training center, and R&D to address spent fuel.

Congress has sent mixed signals on Yucca Mountain so far this year. The House Appropriations Committee approved the full DOE request for FY 2018, but the Senate committee, largely at Dean Heller's (R-NV) behest, included no funding for the repository in its version of the bill. McCullum

says he is optimistic that a compromise in conference committee later this year will include “something more than zero.”

A 49–4 vote by the House Energy and Commerce Committee on 28 June to authorize resumption of the licensing process (H.R. 3053) signaled strong bipartisan support for the repository. A committee staffer says the lopsided vote indicated the waste issue “isn’t a red state versus blue state thing” but reflects the level of constituents’ concern with the growing spent fuel inventories at reactor sites nationwide. In addition to the 99 operating reactors at 61 plants, spent fuel is located at 20 shut-down reactors at 17 sites. Seven of the closed plants have been fully dismantled, and waste casks are all that remain onsite. Altogether, spent fuel is stored at 83 locations in 34 states.

MORE CAPACITY NEEDED

The Yucca Mountain license application covers 70 000 tons, including the equivalent of 7000 tons of DOE high-level wastes left over from nuclear weapons and other operations. Inventories at commercial reactor sites now total about 78 000 tons, according to the NEI. The House bill would amend the law to raise Yucca Mountain’s storage cap to 110 000 tons. Room for several hundred thousand tons will be required since most of the current fleet of reactors have already been, or are expected to be, relicensed to operate for several decades to come. However, current economic conditions, mainly the low cost of natural gas, have led to the early closure of several nuclear plants. There’s room for as much as 400 000 tons inside just one ridge, and additional capacity can be developed in a second ridge that has very similar geology, McCullum says.

Some $40 billion has been collected in a federally controlled nuclear waste fund to pay for construction and operation of the repository. About $36 billion of that money—paid by utilities that operate nuclear plants through a surcharge on their customers' electricity rates— remains unspent.

Although contributions to the fund were suspended in 2014, they could resume once a federal court is persuaded that progress toward construction is occurring. The NEI says that assuming resumption of payments, and interest, the fund should cover the $96.2 billion estimated cost to build the repository, transport the waste, and operate the site for the 150 years it will accept material. That estimate, prepared by DOE in 2008, is the most recent available.

Other nations, including Finland, France, and Sweden, are developing repository sites, but Yucca Mountain is unique: It is the only one located above the water table. The region's sparse rainfall—which could grow with a changing climate—could seep into the 64 kilometers of tunnels where the waste is to be housed, and potentially leach radioactive materials into groundwater over time. McCullum, however, cites one advantage: Emplacements above the water table will ease the retrieval of waste should the repository be found unsuitable in the future.

Halstead argues that constructing the repository in a shale formation, such as at France's designated facility, would cost $20 billion less than Yucca Mountain, even after accounting for the billions of dollars that have already been sunk into studying the site.

ENGINEERING QUESTIONS

The less-than-ideal geology of the Nevada site—an oxidizing environment in fractured rock with a complex geologic and tectonic history—necessitated the addition of some engineered features to the repository design. For one, DOE's design calls for creating thermal zones in the pillars between the tunnels to channel away some of the heat generated by the waste while keeping the surrounding rock near 100 °C to stave off water intrusion.

Fettus, the NRDC lawyer, says the Yucca Mountain project "went off the rails" within a few years after the site's 1987 selection, when geological analyses turned up problems. After that, "it became an exercise of adjusting standards to make it work."

McCullum says the design recognizes that the engineered barriers will degrade over time. "You have this footrace between geologic processes and the radiological decay process, where the winner is the slowest. The geologic processes are slower than the decay, so by the time the [materials] break down over hundreds of thousands to a million years, no harmful radiation is released."

The most expensive, and arguably the most controversial, components of the repository are the titanium drip guards that would be installed to keep the waste casks dry. DOE estimates their cost at $7.8 billion. McCullum contends they are an unnecessary expense; Halstead questions whether a minimum of 11 500 shields weighing nearly 5 tons apiece could be installed remotely in the high-temperature, high-radiation

environment in the tunnels. “Will NRC make DOE install them a century from now?” he says. “Can DOE actually fabricate and install the drip shields as proposed? Will they actually work?”

Absent the shields, groundwater contamination could exceed the 10 000-year standard in fewer than 900 years, and the million-year limit would be breached in fewer than 2000 years, Halstead maintains. The state also contends that DOE has underestimated the shields’ cost by a factor of two.

Halstead notes that many Nevadans have a deep distrust of DOE, dating to the years of atmospheric nuclear tests that were carried out in the state by DOE’s predecessor, the Atomic Energy Commission. At an April House hearing, Nevada Representative Dina Titus (D) recalled mushroom clouds visible from Las Vegas, less than 161 kilometers away. Since atmospheric testing ended in 1963, she said, billions of dollars have been paid out in settlements to residents of Arizona, Nevada, Utah, and other nearby states who contracted illnesses from exposure to radioactive fallout. “I give this history lesson not only to highlight the contributions that Nevada made to atomic development but also to remind you that they told us we were safe then, and they’re telling us we’re safe now,” she testified.