

## ENERGY

# Trump Eyes Rebooting Yucca Mountain, as Nuclear Waste Piles Up

The White House has asked Congress for \$120 million to jump-start the stalled development of a permanent storage facility for the nation's nuclear waste – but a resolution to the decades-long debate appears as unlikely as ever.

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**A**cross the United States, in pools of cold water and thick steel-and-concrete drums, sits the unwanted residue of America's nuclear power plants.

More than 75,000 tons of highly radioactive spent fuel rods that once powered commercial reactors are waiting for a permanent home, where they can be locked away safely for the thousands of years it will take the isotopes within to decay. Plans for that repository have been on hold since the Obama administration pulled the plug on the site at Yucca Mountain, about 100 miles outside Las Vegas, after years of bipartisan objections from Nevada officials.

But a pair of developments this week have put new focus on the question of what to do with that high-level nuclear waste. The Trump administration has asked Congress for \$120 million to jump-start the stalled Yucca Mountain project. And nuclear safety

analysts are urging Congress or state governments to do an end run around federal regulators and require more of that waste be put in dry storage, arguing that would reduce the odds of a trillion-dollar disaster.

Ed Lyman, senior scientist at the Union of Concerned Scientists and one of the authors of an article in the research journal *Science* advancing that argument, [estimated](#) about 80 percent of the fuel assemblies stored in spent fuel pools should be pulled out and sealed in reinforced dry casks.

“Spent fuel is probably going to be at reactor sites for a very long time,” Lyman said. “The question is, given that, what do we need to do to make sure that long-term storage is as safe as possible? That means expediting transfer to dry casks and thinning out the pools.”

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Most spent fuel — the bundles of uranium rods at the core of a nuclear reactor, and the accompanying radioactive isotopes produced by nuclear fission — are kept in deep pools of water at nuclear power plants for several years as they cool down.

If a spent fuel pool leaks, either due to an accident or sabotage, the fuel could overheat and cause a fire that could spread radioactive waste over a wide area. After the Fukushima Daiichi nuclear accident in Japan, the Nuclear Regulatory Commission considered ordering American nuclear power plants to move as many old fuel rods out of the pools after five years — but decided against it.

That was a mistake, according to Lyman and his co-authors, Frank von Hippel and Michael Schoeppner of Princeton’s Program on Science and Global Security. They say a fire at a cooling pool packed with fuel assemblies could be 50 times worse than one holding only a couple of cores, and the NRC underestimated the potential consequences and bowed to industry pressure in killing the proposed rule.

“In my view, they have not fully addressed the lessons of Fukushima, including the true societal impact of the accident,” said Lyman, who argued for the rule before the NRC decision in 2014. “Not just the direct effects of contamination, which are people getting exposed, homes getting condemned, farmland out of service and fisheries ruined, but also the indirect impacts of large numbers of refugees, effects on tourism, and other secondary effects.”

The NRC estimated that a fire in a densely packed spent fuel pool at the Peach Bottom nuclear power plant, located between Philadelphia and Baltimore, would force more than 4 million people to evacuate from the surrounding 50 miles. The NRC estimated

the cost of such a disaster at about \$125 billion; in a paper [published](#) earlier this month, von Hippel and Schoeppner put it at closer to \$2 trillion.

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The prospect of an accident or a terrorist attack that causes a spent fuel fire is considered a low-risk but high-consequence scenario — the NRC calculated the odds at somewhere between 1 in 25,000 to 1 in 142,000. But there was a close call at Fukushima Daiichi, where the tsunami that followed Japan’s historic 2011 earthquake triggered the worst nuclear crisis since Chernobyl.

Not only did three reactors at the plant melt down, but an explosion blew the roof off the No. 4 reactor housing. That unit’s core had been removed and was in the pool when the tsunami struck, raising fears that the still-hot fuel — normally kept under nearly 7 meters (23 feet) of water — would be exposed and catch fire.

With power and instruments knocked out, authorities had to use helicopter overflights and remote cameras to determine whether there was any water remaining in the pool. They found water levels had fallen to less than two meters above the top of the fuel rods before crews began to refill the pool.

NRC spokesman Scott Burnell said the agency welcomes “well-supported analysis” and would review the new paper — but for now, “the NRC stands by the conclusions from the staff’s work to date.”

The Nuclear Energy Institute, the industry’s leading trade association, says there are currently about 75,000 tons of waste piled up at nuclear plants [after 60 years of operations](#) — compared to hundreds of millions of tons of carbon dioxide and other planet-warming emissions released by fossil fuels every year. Rod McCullum, the group’s senior director for fuel and decommissioning, said the industry has safely stored spent fuel in concrete-and-steel pools for decades.

“This most recent perspective on the oft-studied topic offers nothing new and does not change abundant evidence that used fuel at US plant sites is properly managed — a claim consistently verified by industry experts, independent scientists, and the NRC,” McCullum said in a written statement. “America’s nuclear energy facilities have a strong record of properly managing these materials, yet we also look forward to renewed progress toward licensing of the Yucca Mountain repository.”

“The issue may be cash flow.”

That's easier said than done, said Tom LaTourrette, a geologist and the senior physical scientist at the RAND Corporation, the famous California-based think tank. Nevada has fought federal efforts to store its nuclear waste there since the feds designated Yucca Mountain as a permanent repository in 1987, and that opposition doesn't seem to have diminished.

"I'll believe that when I see it," he said. "I'm not thinking anything's really changed."

Nevada's Republican US Sen. Dean Heller [immediately condemned](#) the administration's proposal, asking, "Why should a state without any nuclear power plants of its own be forced against its will to house all of our nation's nuclear waste?" A report released last week by the Government Accountability Office, the investigative arm of Congress, estimated that restarting the process of getting the Yucca Mountain site licensed and approved [could take five years](#). The government has already spent about \$15 billion on the project, including boring a five-mile exploratory tunnel into the mountain; Heller said the cost could end up costing \$75 billion.

"We have a federalist system," LaTourrette said. "States have power, and I don't think you can just shove this down a state's throat."

But most spent fuel pools weren't designed to hold more than one or two fuel assemblies at a time, so operators have had to make several modifications to safely contain more, said Christina Simeone, the director of policy and external affairs at the University of Pennsylvania's Kleinman Center for Energy Policy.

"It's universally accepted that dry storage is safer than wet storage," Simeone said. It makes sense to move fuel rods to dry casks after five years, but it will cost money. NRC figures cited in the *Science* paper estimated that moving older spent fuel to dry casks would cost operators about \$5 billion, at a time when many of them are struggling to stay competitive in electric markets now dominated by cheap natural gas. The Department of Energy has already paid utilities more than \$5 billion to store waste at their plants, and a 2015 CBO estimate said that tab might top \$29 billion before a permanent repository could be built.

"The issue may be cash flow," Simeone said. "There is a lag from the time the investment is made to the time they come to a settlement and get paid, and I don't know if they're reimbursed for those carrying costs ... the margins for these companies might be a little thin."

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But the federal government is already paying operators about \$1 billion a year to house the waste at their plants because of the lack of a permanent repository. And the government has piled up a \$36 billion fund from fees that were collected from ratepayers for a permanent disposal site that was never built.

“I think it is very, very important that the federal government honor this commitment, whether it’s an interim storage facility or ideally a permanent repository,” Someone said. “Because this situation where the communities that overpaid and are accepting more risk, and they’re not getting compensated for that risk, is inequitable.”

And LaTourette said the feds are in a Catch-22: The Obama administration explored options for holding nuclear waste at an interim storage site, but federal law requires that a permanent site get built before establishing any interim site.

“Initially, this was meant to prevent them from getting partway there and getting stalled and then having an interim become a de facto permanent site,” he said. “But look at what we’ve got now. Talk about de facto permanent.”

But Lyman said Congress could help reduce the risk of long-term storage by appropriating the money needed to put more waste into dry storage — or, as nuclear utilities seek state help to keep plants open, states could require it as a condition of subsidies.

“States don’t have the legal authority to require nuclear plants to do something for safety reasons,” he said. “But there’s nothing saying a state couldn’t say, ‘We’ll bail you out, but you need to spend some of that money improving safety and security.’ That’s certainly within their ability, to have a private contractor or a utility deal with that.”