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Startup linked to former DOE chief seeking path to nuke waste disposal license

BY JEFF BEATTIE

Two senior senators have shown initial interest in a new radioactive waste disposal plan proposed by a start-up firm backed by former Energy Secretary Steven Chu, nuclear experts and several Silicon Valley figures that says it has adapted hydraulic fracturing technologies to more efficiently carve out underground disposal facilities capable of safely confining spent reactor fuel and other dangerous waste.

Sens. Shelley Moore Capito (R-W.Va.), chair of the Senate Environment and Public Works Committee's clean air and nuclear safety subcommittee, and Sheldon Whitehouse (R.I.), ranking Democrat on the panel, recently asked the Nuclear Regulatory Commission whether private firms can get a license to build a disposal facility to help solve the nation's nuclear waste problem. Currently, only the Energy Department is seeking such a license.

While the senators declined to comment on the reasons for their inquiry to NRC, well-placed sources confirmed to *The Energy Daily* last week that they were asking on behalf of the startup, Deep Isolation, which is backed by Chu and other scientists based at the University of California (UC) at Berkeley.

Deep Isolation says it has adapted horizontal drilling techniques used in oil and gas "fracking" operations for the purpose of nuclear waste disposal. Unlike straight, mile-deep "boreholes" that DOE has contemplated as disposal paths for certain wastes, Deep Isolation plans to drill down a mile and then turn its drills horizontal for an additional mile or more, vastly increasing space available for waste emplacement.

Others backing the startup include Per Peterson, a Berkeley nuclear engineering professor and former member of President Obama's Blue Ribbon Commission on the Nation's Nuclear Future; Heritage Foundation Founder Ed Feulner; and Will Glaser, a co-founder of Pandora Radio, all of whom are serving as advisors.

Deep Isolation's chief technologist is Richard Muller, a UC-Berkeley astrophysicist and climate scientist. The co-founder and CEO of the start-up is his daughter, Elizabeth, a former policy advisor to the Organization for Economic Co-operation and Development and executive director of Berkeley Earth, a non-profit land temperature and climate science laboratory.

The company says its approach could help solve the nation's nuclear waste problem, which has festered for decades with DOE having made little progress in building the Yucca Mountain nuclear waste repository in Nevada. Congress named Yucca in 1987 as the nation's sole repository for spent nuclear fuel and defense-related high-level radioactive waste (HLRW). But Yucca has been blocked for years by Nevada officials, who call the project unsafe.

NRC can license private companies developing facilities providing interim storage of nuclear waste or spent fuel, as distinct from disposal facilities. NRC is currently considering license applications for storage facilities in New Mexico and West Texas by two companies.

But for waste disposal, current law is silent on whether NRC can license a private entity's disposal facility, assigning that job to DOE by saying the DOE secretary "shall" seek a license for final repository.

In a March 19 letter to NRC Chairman Kris-

tine Svinicki, Capito and Whitehouse asked if NRC was legally authorized to accept a license application for a waste disposal facility from a "private entity." Alternatively, they asked if NRC could accept a private entity's license if the entity was a DOE contractor.

In a June 6 response, Svinicki said the answer was "no" under both circumstances.

"Regardless of whether a private entity is a DOE contractor, the NRC may not license that entity to permanently dispose of spent nuclear fuel or high-level radioactive waste...," she said. "The NRC is not authorized to license any entity other than...DOE to permanently dispose of spent nuclear fuel and [HLRW]."

However, Svinicki left open one possibility for Deep Isolation under current law: Enter an arrangement with DOE such that DOE seeks a license with Deep Isolation alongside developing the disposal facility.

"DOE may...enter into a contract with a private entity to prepare, or to support preparation of, such an application on behalf of DOE...," Svinicki said.

Capito and Whitehouse are nuclear power backers, with Whitehouse supportive of advanced nuclear technologies to help combat climate change. However, it is not clear whether either senator was working directly on behalf of Deep Isolation or, as heads of the subcommittee with NRC oversight, asking the question on behalf of another lawmaker.

But in an interview Friday with *The Energy Daily*, Elizabeth Muller said "we are grateful for the clarification" from NRC as to private entities and NRC licensing, and said the company is considering all options.

"Two years ago we were told that a private company could not do disposal of nuclear waste in any case...," she said. "It's certainly not going to be easy, but there is some interest; it might be [possible] through regulatory clarification...[or] through legislation and we are grateful for these conversations at all levels."

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In a video on Deep Isolation's website, Chu said of the company's plan: "What they are proposing is very intriguing and it sounds like it really could be practical."

In the interview Friday, Richard Muller said the company envisions drill-holes at least eight inches in diameter, wide enough to accommodate a single spent fuel assembly from a boiling water or a pressurized water reactor, one at a time. Deep Isolation has developed a proprietary, non-corrosive canister for the fuel assemblies, which it is seeking to patent, he said.

According to the company's web site, Deep Isolation envisions one of its 2-mile-long drill-holes holding eight years of waste produced by a boiling water or 33 years of waste produced by a pressurized water reactor.

The use of boreholes for nuclear waste storage is not a new idea, and has been studied in the United States, Sweden and Russia. One problem is that waste, once emplaced, was seen as irretrievable, a problem if a policy decision was made to recycle spent fuel.

But Richard Muller says Deep Isolation's system can retrieve waste using methods pat-

terned after those commonly used in fracking operations when drillers pull out damaged equipment or sensors.

Importantly, Deep Isolation's system has another commonality with oil and gas fracking—the shale rock formations that fracking operations are designed to split apart, releasing oil and gas.

Muller says Deep Isolation intends to drill into shale formations and to store nuclear waste within or below the formations, leveraging drillers' knowledge about drilling in shale. And Muller says shale rock's effectiveness in trapping oil and gas reserves over long periods of time should help Deep Isolation make the case that shale can also safely entomb nuclear waste.

A clear obstacle that Deep Isolation might face is community opposition. Under President Obama, DOE attempted a "deep borehole" program that, if successful, would have provided a vertical disposal pathway for small volumes of HLRW. However, initial DOE efforts to site a test borehole for simulated waste were spurned by communities in three states and the project was cancelled in May 2017.

However, Elizabeth Muller said Deep Isolation's approach and technology are entirely different.

She says the company plans to present the "option" of a drill-hole to communities that already host nuclear waste or spent fuel.

"We are looking at taking the waste that has already been generated and securing it near its current location," Muller said. "We are getting it out of the community—we are putting under a mile of rock," she said.

"That is a somewhat easier 'ask' than for a community to provide [disposal] for waste that has been generated somewhere else," she said.

Muller said the company has developed a siting team that is refining the company's approach. Among those working with Deep Isolation appear to be some associated with DOE's recently cancelled "consent-based" program seeking volunteer communities to host waste storage, as well as the President's Blue Ribbon Commission on the Nation's Nuclear Future

Muller said Deep Isolation has raised about \$4 million and is seeking additional investors.