

Muller and Baltzer: Deep Isolation's solution to nuclear waste disposal

Founded in 2016, the private company Deep Isolation is adapting directional drilling technology developed by the oil and gas industry as a permanent solution to high-level waste disposal.

On January 16, at a commercial testing facility for oil and gas drilling in Texas, the California-based company Deep Isolation Inc. demonstrated its deep horizontal drillhole technology as an option for disposing of nuclear waste. The demonstration involved lowering a prototype waste disposal canister 2,000 feet down an existing drill hole using a wireline cable, detaching it, and hours later bringing it back to the surface (NN, Feb. 2019, p. 48). The canister, measuring about 4 inches in diameter by 36 inches in length, held a steel rod to simulate the weight of radioactive waste. Using directional drilling technology, the company aims to provide a safe and affordable solution to the permanent disposal of high-level waste and spent nuclear fuel.

The company was founded by the father and daughter team of Richard and Elizabeth Muller. Elizabeth, who serves as Deep Isolation's chief executive officer, is also the cofounder and executive director of the environmental group Berkeley Earth, as well as a former policy advisor to the Organization for Economic Cooperation and Development. In August 2018, the company brought in as its chief operating officer Rod Baltzer, the former CEO of Waste Control Specialists, of Andrews County, Texas, and a 20-year veteran of the radioactive waste industry.

Nuclear News Associate Editor Tim Gregoire spoke to Elizabeth Muller and Rod Baltzer on the sidelines of the 2019 Waste Management Conference (see page 50) about the company's disposal concept and its plans for the future.



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Elizabeth, how do you feel your background in environmentalism and policy informs your role in Deep Isolation?

Muller: Environmentalism is at the core of Deep Isolation. For the past 10 years, I've been running a nonprofit, Berkeley Earth, whose main focus is big environmental issues in need of solutions, such as global warming and air pollution. And I have definitely brought that with me to Deep Isolation.

Yes, we are a technology company, but I sometimes joke that we are less than half a technology company. And with the nuclear waste industry, especially the nuclear waste disposal industry, a good technical solution alone is not what is going to solve the problem. We need something that really engages the public, and stakeholder engagement is a core part of what we do. This involves communication, in particu-

lar two-way communication, and a lot of deep listening. That is really fundamental to the company and probably the most important thing that I bring.

Rod, how has your experience with Waste Control Specialists prepared you for the work you're doing now?

Baltzer: When I was at Waste Control Specialists, we were the first company to license a low-level radioactive waste facility since the Low Level Radioactive Waste Policy Act was passed over 30 years ago. When Liz asked me to do the same for high-level waste with Deep Isolation, it seemed like there were a lot of similarities. There is still the community engagement piece, a lot of policy and legislative pieces, and the operational and technical pieces of what we do. I was also at WCS when it started getting involved in interim storage, so I was familiar with high-level waste and spent nuclear fuel, and this is just taking that a little further and doing it at a higher level.

Initially, what waste packages is Deep Isolation looking to use this technology for?

Muller: The demonstration we did was for smaller waste packages, but we are certainly interested in spent nuclear fuel. That has always been our core focus—how can we dispose of spent nuclear fuel? Now, defense waste is an easier starting point in the United States because of the Nuclear Waste Policy Act, and that will be our primary focus here for the next few years. Internationally, we are definitely looking at both. And I would say that even for defense waste, we can accommodate larger packages. Eighteen inches [diameter] is going to be pretty straightforward. Once we get above that, it's going to get a little bit more complicated, but we are looking at going all the way up to 36 inches.

Baltzer: And that would hold vitrified glass canisters. Those packages are fairly large.

Does Deep Isolation have a timeline for moving forward in approaching the disposal of spent fuel and larger waste packages?

Baltzer: I want to start by saying that we think we are a complement to Yucca Mountain—we are not opposed to Yucca Mountain. There's 80,000 metric tons of spent fuel already in the U.S. Yucca Mountain is limited to 77,000 metric tons, so we need a second repository. We have started talks in the industry and with communities near nuclear power plants and near Department of Energy sites, saying that we do have a solution, that we think it's unique, and asking if they are interested

in a dialogue. We've already started that process. The DOE is aware of us, the Nuclear Regulatory Commission is aware of us, and we are proceeding through those discussions.

Muller: I would say, in terms of a time frame, it will depend on the time frame for changing the Nuclear Waste Policy Act. We are looking at that and are hopeful that it might change in the next few years. But until then, we are focused on defense waste in the United States.

Baltzer: As far as actual implementation to operations, once you have the license and are ready to go, you can have a hole drilled and start emplacing waste within a year. It's very quick to operations once you get through the licensing stages.

As far as licensing, do you anticipate applying for separate licenses for the disposal method and for each borehole site?

Baltzer: It would be one license. There are a couple of different ways we could do it. We would anticipate that we would have a generic license that covers the processes, procedures, equipment, tools, etc. Then for each specific site there would be the specific geologic characteristics, so our performance assessment would be tuned for that particular site. But we would expect that there would be a kind of a generic license that would be approved to begin with, then a site specific—almost like a license amendment—for each site. But there would be only one license.

Why do you feel a private enterprise like Deep Isolation is better suited to doing this than a federal agency?

Muller: When we had the vision of putting waste in horizontal boreholes, our first thought was that we should simply write a paper on this and give it to the DOE, and they could take it forward. Then we realized, well, if we do that, nothing is going to happen; it is never going to move forward. It really takes a private company, we think, to change things in a dramatically new way. We sometimes compare ourselves to SpaceX. NASA was doing good work, but this private company came along, and they can do it better, cheaper, faster, and safer. And we think that it is time for private innovation to help with the nuclear waste disposal issue.

Baltzer: I think you saw that in the demonstration, where Deep Isolation has now put a canister underground. It is the first time anyone has taken a disposal canister—it was cold, there was no radioactive waste in it—but we took it underground and proved that we could retrieve it. The DOE wasn't able to accomplish that, but Deep Isolation as a private entity did.

The DOE recently tried to investigate deep borehole disposal methods but was stymied by public and political opposition. How will Deep Isolation avoid the same fate?

Muller: We actually looked at two sites

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for a demonstration, and both were very welcoming. This was not necessarily a given, going into it. There was a process that we went through to talk to the local communities. I do think that, being a private company, those conversations were easier than if we had been required to follow official government procedures. We were able to go in early and talk to people, saying we are possibly doing this near your community and here is what it would entail. And we asked them, "What do you think? What are your concerns? Can we answer your questions?" We did that in multiple communities, and they were open to us.

As a private company that grew out of an environmental organization, this is one of the things that we can really do right. As long as we are transparent about what we are doing and keep an open dialogue with communities and stakeholders across the country, I think we can partner with key groups to help solve a problem that is impacting all of us. Not to say it is going to be easy. I don't think it's going to be an easy thing to find a site, but I think that we are going to succeed because this is a solution that will be right for some communities and waste streams.

A seven-minute video on Deep Isolation's January demonstration event is available at <www.youtube.com/watch?v=3GZ-4TC8ttbE>. **NN**