CNBC

Nuclear waste recycling startup wants to solve the 'ball and chain' problem holding back nuclear

Catherine Clifford - Yesterday 4:14 PM

- Ed McGinnis knows firsthand about the nuclear waste problem in the United States after working for the Department of Energy from 1991 to 2021.
- In January, McGinnis joined Curio, a nuclear innovation startup, to become its CEO.
- McGinnis told CNBC about Curio's plan to solve the nuclear waste problem for the United States while also making valuable products out of the used fuel, including fuel for next generation reactors and isotopes valuable for space batteries and medical processes, to name a few examples.

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Ed McGinnis, CEO of Curio.

Ed McGinnis knows a lot about the nuclear waste problem in the United States. He worked in U.S. Department of Energy from 1991 to 2021 and dealt directly with the U.S. government's failed effort to build a nuclear waste repository in Yucca Mountain, Nevada.

"I certainly have the tire tracks on my back" from trying to lead the United States to develop and execute a long-term storage plan for nuclear waste, McGinnis told CNBC in a phone conversation in June.

"Essentially, both parties have said it's politically unworkable" to find a permanent solution, McGinnis told CNBC. "But during the meantime, we have a huge, huge unresolved problem representing pretty much the largest ball and chain on the ankle of the U.S. nuclear energy sector that's trying to transition itself for the next generation of reactors."

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This undated image obtained 22 February, 2004 shows the entrance to the Yucca Mountain nuclear waste repository located in Nye County, Nevada, about 100 miles northwest of Las Vegas.

McGinnis no longer works for the government, but he is still working to solve the nuclear waste problem at the helm of a startup called Curio, founded in 2020 by brothers Yechezkel and Yehudah Moskowitz as part of their investment holding company, Synergos Holdings.

The brothers founded Curio to develop next-generation advanced nuclear reactors. After some research, they decided there were already many companies innovating in that space, but far less competition to deal with the nuclear waste problem.

The United States generates about 2,000 metric tons of new nuclear waste per year, adding to the approximately 86,000 tons that are already generated. Reprocessing nuclear waste is one way to make it less radioactive, but there's only enough capacity in the world to reprocess 2,400 tons per year, and most of that is in France (1,700 metric tons) and Russia (400 metri

The pre-revenue, ten-person startup is still in the very early stages of a capital-intensive, long-term build out. But it aims to have a pilot facility up and running in six years and a commercial nuclear waste reprocessing facility up and running by 2035, McGinnis told CNBC.

Curio's commercial plant will have a capacity of 4,000 metric tons when fully built out. It will cost $5 billion to build and it will be about the size of an NFL football stadium.

"We would take title of all 86,000 metric tons and the federal government and the public would never see that high level radioactive material on their books again, we would take the burden of it," McGinnis said. "And we would take trash and turn it into products and treasures. That's our business line."

Ed McGinnis, CEO of Curio.

Turning trash into treasure

Calling the fuel that comes out of conventional reactors waste is a misnomer, according to McGinnis, because only 4% of the potential energy value has been used. But it's dangerous, with enough radiation to harm humans for approximately a million years.

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Curio has developed a chemical process it calls NuCycle to turn nuclear waste into usable products, like fuel for advanced nuclear reactors, as well as isotopes that can be used for other functions, such as generating ingredients to make power sources for space missions, and power sources for tiny batteries.

The process reduces the amount of radioactive waste to less than 4% of what it started with. That waste would require only about 300 years of storage, McGinnis told CNBC.

"There is essentially a treasure trove of products and commodities that are waiting to be extracted from this so called waste," McGinnis told CNBC.

Right now, Curio is "refining and validating the chemistry," McGinnis said. Some of that work involves collaborating with scientists at the national labs around the country, but those partnerships are in very early stages.

Critically, Curio's technology will be different from an existing process called PUREX (plutonium uranium reduction extraction), "which among other things separates and extracts plutonium in a pure stream," which can be a problem under nuclear weapons non-proliferation treaties.

"We have a process where we never separate out pure plutonium," McGinnis said. "We're never going to do that because we want to have a proliferation security-hardened process. We have self-protection built in."

Jim Geary, facility manager at the Waste Receiving and Processing facility (WARP), looks over a shipment of three TRUPACT transport containers on the Hanford Nuclear Reservation June 30, 2005 near Richland, Washington. Each container holds 14 55-gallon drums of transuranic (TRU) waste that has been processed and will be sent to the Waste Isolation Pilot Plant (WIPP) in New Mexico.

One of the most challenging aspects of dealing with nuclear waste is convincing local community members to accept a facility in their backyard. "Public communication is very, very important," McGinnis said.

Curio said it is engaged with multiple states about locating its facility there but declined to name them. But he believes the economics would be helpful for many local communities. "A facility like ours would employ well over 3,000 full time, well paid jobs," McGinnis said.

McGinnis also says negotiations for a recycling facility are going to be easier than those that are for a permanent repository.

"I led efforts meeting with states trying to convince them of why they should accept material that's going to be there for 10,000 years. That's a very, very difficult thing," McGinnis said. "And I can understand why the NIMBY communities see that as a big issue. But again, this is apples and oranges." (NIMBY is an anacronym for "not in my back yard.")

What independent experts are saying

The U.S. needs to explore new and innovative technologies solve its nuclear waste problem, Steve Nesbit, the former president of the American Nuclear Society, told CNBC.

"When advanced reactors get going, it makes more sense (to me) to develop and deploy recycling for those materials," he told CNBC. It's possible to recycle waste and put some elements of that recycled waste back into the existing fleet of nuclear reactors, but "it is better suited for some advanced reactor designs," he told CNBC.

He said he "certainly" knows McGinnis, but added "Curio is keeping its cards pretty close to the vest, for now."

Curio's goals are formidable, said Ashutosh Goel, a Rutgers professor who has done research on dealing with nuclear waste with a process called "immobilization."

"Yes, what Curio is targeting is ambitious. However, isn't that the case with anything in nuclear energy?" Goel told CNBC. "If we are serious about reducing the carbon footprint and still meeting the energy demands of the nation, we cannot accomplish this goal without nuclear energy."

Goel does not know Curio or McGinnis personally but is aware of them professionally. "Ed is a well-known leader in the field of nuclear energy, thanks to his leadership roles in the US Department of Energy. Therefore, I am hoping for positive things from Curio," Goel said.

Curio is making smart steps early on, according to Ben Cipiti, a nuclear engineer at Sandia National Labs, that is working on a proposal for an government grant with Curio.

"I see Curio as having a good shot at making progress in this area since their approach utilizes lessons learned from the past," Cipiti told CNBC. "They're partnering with national laboratories to take advantage of the latest research and development and the wide variety of expertise required to be successful in this area."

If Curio is successful, the work could be transformational for the industry as a whole.

"Once we solve this, in my humble opinion, I think it it Tesla-fies the nuclear industry in a way we've never seen, because it's such a heavy ball and chain on on the nuclear sector — it affects public opinion, acceptance, economics, investors," McGinnis said. "So when we finally show a no nonsense, thoughtful solution to the back end, that's when the nuclear energy sector takes off in my view."