

Curio NuCycle® Proven in Groundbreaking Lab-Scale Demonstration, Accelerating Path to Commercial Nuclear Recycling

New Technology Demonstrated in Multiple DOE National Lab Public-Private Partnership Will Strengthen U.S. Energy Security and Environmental Stewardship

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-- [Curio](#), a leader in advanced nuclear technologies, today announced the successful completion of groundbreaking laboratory-scale demonstrations in collaboration with four U.S. Department of Energy laboratories – Idaho National

Laboratory (INL), Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory (PNNL), and Sandia [National Laboratories](#) – supported by DOE's ARPA-E CURIE program and GAIN voucher initiative.



Curio is Committed to pioneering new solutions that reshape the future of nuclear energy, standing at the forefront of nuclear technology innovation, driving breakthroughs in sustainable nuclear power generation, fuel recycling, and waste management.

“

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*Edward McGinnis, CEO of
Curio*

Following more than half a century of outdated processes like PUREX and Argonne National Laboratory's pyro-processing, nuclear fuel recycling is entering a new chapter redefined by Curio's NuCycle® technology. Conceived in the private sector and built upon decades of American innovation, NuCycle is the first nuclear fuel recycling technology designed from the ground up with safeguards and proliferation-hardening integrated into its process to be tested and validated at the lab scale, heralding a new, commercially-driven era for the industry.

THE TECHNOLOGY

Curio's [multiple patents](#) cover its fully integrated, safeguarded-by-design process for safely

recycling the nation's 90,000 metric tons – and growing – of used nuclear fuel and the design of a reactor that completes the closed fuel cycle, transforming this liability into new, proliferation-hardened fuel and valuable isotopes.

“Nuclear energy cannot power America's future without solving the back end of the cycle,” said Yehudah and Rabbi Yechezkel Moskowitz, founders of Curio and managing partners at the Synergos Fund. “That's what NuCycle delivers: not just a technology, but a safeguarded industrial platform that transforms spent fuel into a secure, domestic supply of next-generation reactor fuel. We see this as the foundation of a truly closed fuel cycle that will strengthen U.S. energy independence for generations.”

“Our philosophy was simple: harness breakthroughs demonstrated in petrochemicals and metallurgy—modularity, process intensification, automation—and apply them to the nuclear back end,” said Vik Singh, Chief Innovation Officer and Principal Investigator of the lab scale programs. “NuCycle is the result: an integrated, modular, proliferation-hardened recycling process built from the ground up with safeguards, automation, and economic viability as core principles.”

LAB VALIDATION

In partnership with ORNL, Curio successfully demonstrated its innovative voloxidation techniques, offering unprecedented efficiency and scalability in decladding spent nuclear fuel. These lab-scale tests released more than 99.75% of the fuel from its zircaloy cladding, providing major validation for a process poised to replace the more burdensome, costly, and less environmentally friendly methods currently used worldwide. Under DOE's GAIN voucher program, ORNL completed criticality safety assessments of Curio's next-generation equipment designs with no safety constraints identified.

The pulverized product from the decladding process was then shipped to PNNL, where Curio's breakthrough fluorination circuit was validated. The process achieved decontamination levels of sub-parts-per-million levels for key contaminants that yielded enrichment-ready uranium hexafluoride (UF₆) at some of the purest levels ever recorded from a single-stage process. Working with partners at PNNL, Curio successfully scaled this essential chemistry from milligram-level experiments to 100 grams – a 10,000-fold increase in capacity – proving both its viability



Curio announces completion of critical laboratory-scale demonstrations in collaboration with four U.S. Department of Energy national laboratories – Idaho National Laboratory (INL), Oak Ridge National Laboratory (ORNL), Pacific Northwest National Laboratory

and scalability. Eliminating the need for additional conversion and distillation steps, this achievement establishes a new critical pathway for domestically sourced UF₆ for the U.S. market, and promises major cost savings for the nation's reactor fleet.

At INL, Curio acquired world-first data that enables its advanced electrolysis process. This foundational work, which spanned all actinides present in spent nuclear fuel, was conducted in a molten-salt bath. By systematically varying temperature and concentration, the teams were able to study the fundamental redox chemistry that will enable co-extraction of plutonium with uranium and minor actinides in a proliferation-hardened manner, providing crucial insights and validation for the future of comprehensive fuel recycling and its re-use.

"INL is proud to be the go-to location for the industry developing cutting-edge nuclear technology," said Jess Gehin, Associate Lab Director of the Nuclear Science and Technology Directorate at INL. "In the last couple of years of collaboration, INL was able to measure key performance metrics of the NuCycle process, yielding data that will guide pilot-scale equipment design."

The data from these foundational lab-scale experiments are now informing Curio's work with Sandia to develop a comprehensive safeguards and security model. This collaboration will conduct iterative material control and accounting (MC&A) analysis, using the experimental results to create the first-ever nuclear fuel recycling process that is safeguarded by design.

"Having spent 20 years on the generating side of this industry, including spent fuel management, I know these results are a game changer," added J.R. Majewski, Curio's Chief Program Officer. "This is about more than just technology; what Curio is achieving with our partners will solve real-world legacy challenges, lifting the burden of spent fuel storage from operators. We're poised to deliver the sustainable, closed fuel lifecycle the industry has always wanted."

NEXT STEPS

"We are moving at a pace the industry has never seen to deliver a fundamentally new, safeguarded-by-design platform that will redefine the economics and security of the entire nuclear fuel cycle. These unprecedented results demonstrate the strength of public-private collaboration in advancing sustainable nuclear solutions," said Ed McGinnis, CEO of Curio. "ARPA-E and GAIN support allowed us to bring a truly closed fuel cycle within reach. We are thankful for the continued support of the DOE under the leadership of Secretary Wright."

Curio's ARPA-E CURIE award, received in 2023, enabled side-by-side lab demonstrations of the complete NuCycle® flowsheet at INL, ORNL, and PNNL, which have now met key go/no-go milestones, delivering unprecedented insights into the process chemistry and kinetics.

"ARPA-E's support for Curio's lab-scale demonstrations exemplifies our commitment to innovation in energy solutions and nuclear fuel recycling," said Dr. Jenifer Shafer, ARPA-E CURIE

Program Director. "We're proud to advance technologies that enhance waste minimization and resource recovery that also enable nuclear energy deployment."

Curio is leveraging these results to finalize engineering specifications for its pilot-scale NuCycle modules, targeting demonstration by Q4-2027. In continuation of its demonstration efforts, Curio intends to complete its lab-scale demonstration with actual spent nuclear fuel at INL, and is actively exploring a first pilot with the DOE. The company continues to engage with regulators to secure licensing, and secure offtake agreements with multiple industry partners ahead of commercial operations.

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Curio

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