

Touring Oak Ridge's future nuclear energy hub (part 2)

ORANO USA and OKLO

(As published in The Oak Ridger's Historically Speaking column the week of February 16, 2026)

Carolyn Krause is exploring what's happening in Oak Ridge. She has read that new companies are investing in building facilities on Oak Ridge land partly for creating tomorrow's nuclear reactors and making the special fuels they need to power future data centers for advancing artificial intelligence.

The companies will help to meet the goals of the Department of Energy's Manhattan Project 2.0. DOE is aiming to ensure that the United States maintains its global leadership in AI and its competitiveness in national security, economic prosperity, and scientific discovery through supercomputing and quantum computing. AI data centers, which require electricity 24/7, and of all the energy sources, nuclear power is the most reliable, generating electricity more than 90% of the time.

Past accomplishments can lay a path for future achievements. As this Historically Speaking column has often mentioned, researchers in Oak Ridge and elsewhere learned in the past century how to make nuclear fuel and nuclear reactors, on land and sea, that have used the fuel for decades to produce electricity worldwide. Oak Ridge helped chart the way for developing advanced nuclear fuels and designing easier-to-build. These safer, more efficient, and less expensive small modular reactors will require the new fuels to meet 21st century needs for power.

On Tuesday, Oct. 21, during Nuclear Science Week sponsored by the American Museum of Science and Energy in Oak Ridge, Carolyn took the New Nuclear "Dirt Tour" on a luxury bus paid for by Kairos Power. It helped her find out more about how and why Oak Ridge is becoming the "core of America's nuclear renaissance." The tour "guides," lunch speakers, and passengers were well-educated on nuclear companies' plans for the future in Oak Ridge, as well as her internet searches using AI chatbots, which provided excellent information, much of which she presents in this five-part series.

A goal of the United States is to quadruple the use of nuclear power by 2050. The reason is the anticipated surging demand for electricity by growing populations and the rapid addition of electronic devices, electric vehicles, and power-hungry AI data centers.

For those of us older than 75 on the luxury bus on which speakers provided us with information on the New Nuclear Dirt Tour, the sites of nuclear projects at the west end of Oak Ridge seem like newly born great-grandchildren. We may never know how companies in Oak Ridge's western "nuclear zone" will turn out. Their projected time for producing nuclear fuel or generating electricity by advanced reactors using that special fuel is between 2030 and 2040.

Orano USA. As the bus traveling west on the Oak Ridge Turnpike in Roane County neared the road into the Horizon Center Industrial Park on the right, it turned left, crossed the Turnpike, and took a gravel road on forested land. The undeveloped site, consisting of field and forest, will be the home of Orano USA's future multibillion-dollar uranium enrichment facility. At \$4.5 billion, it represents one of the largest investments in Tennessee's history and the largest among the numerous nuclear energy announcements in the state.

The 627-acre site is just west of the Oak Ridge Enhanced Technology and Training Center. That's where Gov. Bill Lee, on Sept. 4, 2024, announced that the new facility, which will use gas centrifuges to produce enriched uranium for nuclear power plants, will be built by the French-owned Orano company. Called Project IKE in honor of President Dwight D. (Ike) Eisenhower's landmark "Atoms for Peace" speech, it will receive a grant of \$6 million from Tennessee's Nuclear Energy Fund. A separate \$5 million from this fund will be allocated to Oak Ridge and Roane County for infrastructure improvements needed at the Project IKE site.

After the U.S. Nuclear Regulatory Commission approves Orano USA's applications for a construction permit and a license to operate the plant, Orano USA will install the same type of centrifuges in the plant that it has used in its French facility for many decades. Orano USA plans to produce uranium enriched in

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fissionable uranium-235 up to the level of 10% (LEU+, Low Enriched Uranium plus), a new higher enrichment providing greater energy efficiencies for powering existing reactor designs.

If the market demand develops, Orano could install more centrifuges for higher enrichments up to 19.75% (High Assay Low Enriched Uranium, or HALEU). This relatively high enriched fuel is required by advanced reactors, such as some types of small modular reactors (SMRs) that will be built and operating in the early 2030s.

The United States produces only one-third of the enriched uranium it needs for nuclear power. Another third comes from Europe, mainly France. The last third had been coming from Russia, but the U.S. banned nuclear fuel imports from Russia effective in 2028 after it invaded Ukraine in February 2022. Orano USA, aided by federal funding from the Department of Energy, will play an important role in ramping up nuclear fuel production to help close the domestic gap.

Orano is a global supplier of nuclear fuel and has been supplying uranium at enrichment levels up to 6% (Low Enriched Uranium, or LEU) to U.S. customers for about 40 years. Compared with LEU, HALEU has been called high-octane nuclear fuel.

More than 300 people will work for Orano USA on the Oak Ridge site. Employees will include management engineers, safety professionals, laboratory technicians, training personnel, maintenance staff, health physics technicians, security personnel, marketing and communications experts, as well as transportation specialists.

Orano USA selected the Oak Ridge site partly because of the regional educational resources – University of Tennessee, Tennessee Tech University, Roane State Community College and Tennessee College of Applied Technology campuses. They will be key partners in developing the highly skilled workforce that the new enrichment plant will need.

Curtis Roberts, who wore a Project Ike hat and spoke on the bus and later at AMSE, said he talked with eighth graders during Nuclear Science Week in Oak Ridge about prospective jobs they will be eligible for at Orano USA's Oak Ridge plant in the 2030s if they acquire the necessary training.

Oklo. On Sept. 4, 2025, Oklo Inc. announced plans to invest up to \$1.68 billion to develop the nation's first privately funded advanced nuclear fuel recycling facility in Oak Ridge. In return for the company's large investment, the state, which courted Oklo, will give the startup \$13 million from its Nuclear Energy Fund, making it the fifth nuclear company to receive state dollars, according to Gov. Bill Lee's public announcement. The company's location: 247 acres in the Heritage Center Industrial Park.

By the early 2030s, Oklo plans to begin recycling in Oak Ridge some of the more than 94,000 metric tons of used nuclear fuel stored at nuclear power stations around the country. It will fabricate new metal fuel assemblies from the spent fuel for its fast fission power plants, the Aurora powerhouses. Oklo, headquartered in Santa Clara, California, stated it is exploring opportunities to obtain used nuclear fuel from the Tennessee Valley Authority's (TVA's) seven reactors in its three nuclear power plants.

Oklo was founded in 2013 by MIT nuclear engineering graduates Jacob DeWitte, chief executive officer, and his wife Caroline Cochran DeWitte, chief operating officer. Members of its board have included the Secretary of Energy Chris Wright and Open AI CEO Sam Altman.

For some in the Oak Ridge area, the Oklo announcement was striking for several reasons. Oklo has stated that it would employ more than 800 workers, more than any other nuclear company planning to build facilities in Roane County. Many in the nuclear industry believe this approach to recycling used nuclear fuel, if successful and widely adopted, could lead to a fundamental shift in nuclear energy's business model.

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Traditional light-water reactors (LWR), which produce about a fifth of the electricity consumed in the United States, use only a small fraction of the energy stored in their uranium fuel. Recycling used nuclear fuel increases the amount of usable fuel available by extracting more energy from each ton of mined uranium.

How can the potential energy in spent uranium fuel miraculously be unleashed? The solution is to put the spent fuel in a special type of reactor – a fast fission reactor like that in an Aurora powerhouse.

In this reactor the neutrons produced will be “fast” because the reactor has no moderator (such as water, as in traditional reactors) to slow them down. Fast reactors can cause uranium-238 to fission directly, although still not as well as the uranium-235 or plutonium-239 will in the fuel assembly.

However, as each uranium-238 atomic nucleus absorbs a neutron, it transmutes to a plutonium-239 atom. The newly created plutonium-239 nuclei are highly fissile. They can be split by the next wave of neutrons, releasing a massive amount of energy. Toward the end of the life of a fuel assembly, most of the energy is produced by the fissioning plutonium-239 made in the reactor, enabling the reactor when connected to a steam turbine to reliably generate electricity for years.

Meanwhile, the volume of final waste, which would be solidified in glass for safe storage, would be much reduced, and its radiotoxicity could be measured in hundreds, rather than hundreds of thousands, of years. Together, those factors can reduce fuel costs and environmental impacts while helping improve the public perception of nuclear energy and its handling of waste.

Another question raised when the Oklo announcement was made was whether reprocessing of used nuclear fuel was truly legal. Here's the history and an update. In 1977, President Jimmy Carter indefinitely deferred commercial nuclear fuel reprocessing in the United States amid concerns the recycling method available at the time separated plutonium from other materials. It was feared that the plutonium could be diverted by a terrorist group or rogue nation to make a nuclear weapon.

That policy was reversed in 1981 under President Ronald Reagan. However, a domestic commercial nuclear fuel reprocessing industry was never developed, largely because of the economics, regulatory hurdles and concerns over potential plutonium separation streams. This lack of response left the U.S. nuclear sector reliant on uranium feedstock obtained from abroad.

In May 2025, as part of a drive to revive and modernize the U.S. nuclear industry, President Donald Trump issued executive orders aimed at encouraging commercial reprocessing and advanced nuclear fuel recycling using modern recycling techniques developed in the United States.

In preparation for recycling used nuclear fuel in Oak Ridge, Oklo is working on commercializing electrorefining technology (pyroprocessing), pioneered at DOE's Argonne National Laboratory and Idaho National Laboratory (INL) for the Experimental Breeder Reactor II. EBR-II operated in Idaho from 1964 to 1994.

Pyroprocessing is a modern recycling technique that is safe and environmentally responsible and, unlike previous recycling methods, does not create a separate plutonium stream. In Oklo's Oak Ridge nuclear fuel recycling facility, unused nuclear fuel will be converted into a metal form in a process that has been dubbed “high-tech gold plating for nuclear fuel.”

First, the unused nuclear fuel is placed into a bath of 500°C molten salt that acts as a liquid highway for the atoms and molecules to move through as they are sorted. Then, an electric current is passed through the bath, causing the energy-rich parts of the used fuel – the uranium-238, plutonium, and other actinides – to dissolve into the salt, “swim” toward a collector (the cathode) and stick there, forming a solid metallic crust. Lastly, the final metal crust is melted down and cast directly into fuel assemblies for Aurora powerhouses.

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The uranium, plutonium, and transuranics plate together, so no separate plutonium stream is produced, making it a proliferation-resistant method that prevents bad actors from extracting weapons-grade materials.

Meanwhile, most fission products, considered the primary waste stream, remain in the molten salt; once the uranium and transuranics (including plutonium) are removed, the remaining waste is smaller in volume and easier to manage, and its radiotoxicity declines over centuries rather than millennia.

To learn more about the electrorefining process and Oklo's plans, view the video here:
<https://oklo.com/fuel-recycling/default.aspx>

The final products, which will also be fabricated in Oak Ridge, are metallic fuel assemblies that are part zirconium and part uranium and transuranium isotopes.

To prepare to build and operate its planned commercial fleet of fast-neutron reactors for its Aurora powerhouses, Oklo is constructing its first demonstration Aurora powerhouse, called the Aurora-INL, because of its location at INL in Idaho Falls. In September, Oklo broke ground for this fast-fission reactor.

DOE is providing Oklo with access to recovered spent nuclear fuel from EBR-II. It will be used to fabricate the initial metallic alloy core for the Aurora-INL.

Under the DOE authorization pathway through the Reactor Pilot Program, which is designed to accelerate the deployment of the advanced nuclear technology, Oklo aims to reach criticality at the plant while working with the Nuclear Regulatory Commission for the commercial license framework that governs long-term operations and broader fleet deployment.

The Aurora powerhouses will produce up to 75 megawatts electric – enough to power around 60,000 homes – and, through the deployment of various units, will help meet the demands of customers with scaling energy needs, such as AI data centers, military airbases or industrial sites.

These fast fission reactors have a relatively small footprint of just a few acres, are cooled by liquid metal sodium and use air-cooled condensers. Their impact on the local environment and water resources will be much less than that of other power generation technologies, especially fossil fuel power plants.

The Oak Ridge facility will convert unused nuclear fuel, currently in storage at the taxpayers' expense, into new nuclear fuel for what will be a growing fleet of Aurora powerhouse commercial reactors.

The nation's first privately funded advanced fuel recycling facility in Oak Ridge is expected to help create a secure domestic supply chain of next-generation nuclear fuel for advanced nuclear power plants to ensure American energy dominance into the next century.

Next: TRISO-X (owned by X-energy), Standard Nuclear, and Radiant Nuclear

Thank you, Carolyn, for continuing your review of the nuclear companies featured on the Nuclear Science Week's "Dirt Tour." This is the second in a five-part series being published in Historically Speaking.

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Curtis Roberts, Orano VP of Communications and Press Officer, speaks at the Wilcox K-25 Interpretive Center during the “Dirt Tour” stop for lunch (Courtesy of Ray Smith)



Orano location (Courtesy of Ray Smith)

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Artist rendering of the Oklo reprocessing facility (Courtesy of Oklo)



Jacob DeWitte, CEO of Oklo speaks at the Wilcox K-25 Interpretive Center when the announcement was made that Oklo was coming to Oak Ridge (Courtesy of Ray Smith)