

Touring Oak Ridge's future nuclear energy hub (part 1), *Centrus Energy, Type One Energy*

(As published in The Oak Ridger's Historically Speaking column the week of February 9, 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 to create tomorrow's nuclear reactors and to make the special fuels they need to power future data centers that will advance 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 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 that have used the fuel for decades to produce electricity worldwide. Oak Ridge helped chart the way for developing advanced nuclear fuels and coolants and for designing easier-to-build, safer, more efficient, and less expensive small modular reactors that 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 speaker, and passengers who were well-educated on nuclear companies' plans for Oak Ridge, along with her internet searches using AI chatbots, provided Carolyn with excellent information, much of which she presents in this five-part series.

More than 18 billion dollars! (NOTE: This is a rough estimate based on local or state statistics. – Ray.) That's the projected total of promised capital investments by all the companies that have so far announced plans to build fission and fusion reactors that produce electricity, as well as plants that produce or recycle nuclear fuel in or near Oak Ridge. (NOTE: The East Tennessee Economic Council states 154 nuclear-related companies in our Oak Ridge-Knoxville region employ 40,000 people. The new nuclear companies may add another 2,500 jobs over the next 10 years. – Ray)

It's clear that nuclear will be good for the local economy. But it's unclear whether all the nuclear companies will survive and prosper. (If only half of them survive, their impact will be larger than the Manhattan Project's impact on this region. – Ray.)

Even so, Oak Ridge is on its way to becoming one of the nation's largest advanced nuclear energy hubs. The future of nuclear power in the United States may have been saved more by artificial intelligence (and its power-hungry data centers) than by an intelligent concern about the dangers of climate change.

The bus tour I took was one of the events of the national Nuclear Science Week, sponsored this year by the American Museum of Science and Energy of Oak Ridge. The talks on the bus and at lunch by representatives of the different companies offered insights into the goals and progress of each nuclear project.

On the first part of the tour, we stopped at the sites of Centrus Energy, Type One Energy, Orano USA, TRISO-X, and BWXT. During the first hour and a half, we saw no dirt – just buildings, forests, fields and a bobcat (the compact tractor, not the animal!).

While eating pizza at the William J. Wilcox K-25 Interpretive Center in the Heritage Center, we heard a talk by an executive with LIS Technology. We talked about the unique plans of the nuclear startup Oklo.

Touring Oak Ridge's future nuclear energy hub (part 1), *Centrus Energy, Type One Energy*

(As published in The Oak Ridger's Historically Speaking column the week of February 9, 2026)

After lunch, on the second part of the tour, we visited the sites of Standard Nuclear, Kairos Power, and the Clinch River Nuclear Site of the Tennessee Valley Authority (TVA), the nation's largest public utility.

Along the way, we also heard on the bus from representatives of Energy Solutions, a company in Oak Ridge that manages, transports (mostly by its own train cars), and disposes of low-level radioactive materials, and the Uranium Processing Facility at the Y-12 National Security Complex. It's the largest construction project in Oak Ridge since the Manhattan Project, with a cost exceeding \$10 billion!

Centrus Energy. Our first stop was at the original 100-ft-tall Boeing building on Centrifuge Way. This site on South Illinois Avenue is where Boeing made gas centrifuges and later airplane parts. In 1992, a U.S. government corporation called the United States Enrichment Corporation (USEC) was established to manage and operate the uranium enrichment activities previously carried out by the Department of Energy through its power-hungry gaseous diffusion plants in Oak Ridge, Paducah, Kentucky, and Piketon, Ohio.

The idea was to transition uranium enrichment to the private sector and ultimately transition from 1950s-era gaseous diffusion enrichment to a more efficient enrichment technology: the gas centrifuge. The reason: gas centrifuges use less power and can produce enriched uranium at a lower cost than gaseous diffusion. USEC bought the site in Oak Ridge – now known as the Technology and Manufacturing Center – to manufacture its centrifuges. The company later restructured as Centrus Energy Corp., which is headquartered in Bethesda, Maryland.

In Oak Ridge, Centrus is designing and building improved, more-efficient gas centrifuges that are roughly 40 feet tall and two-and-a-half feet in diameter. Each centrifuge has an output several times higher than a European centrifuge design, making it the most productive centrifuge design in the world. Centrus operates the centrifuges for enriching uranium at its American Centrifuge Plant in Piketon, Ohio, which sits on DOE's Portsmouth Gaseous Diffusion Plant reservation.

When natural uranium is mined from the ground, it contains less than 1% of the fissile uranium-235 (U-235) isotope. More than 99% of the weight is uranium-238 (U-238). Most of the nuclear power plants in operation today – including the entire U.S. civilian reactor fleet – require uranium to be enriched so that the U-235 concentration is between 3 and 5%. This is known as Low-Enriched Uranium, or LEU.

Many of the future advanced reactors, including small modular reactors that will likely be built in Oak Ridge and elsewhere in the nation, require a more advanced uranium fuel with a U-235 concentration between 5% and 20% (19.75% is considered desirable for high-temperature, low-pressure, small modular reactor demonstration projects). Nuclear fuel with these enrichment levels is known as High-Assay, Low-Enriched Uranium, or HALEU, fuel.

In 2023, Centrus Energy began producing HALEU fuel at a demonstration cascade of advanced centrifuges at the Piketon site, making it the only facility in the U.S. currently licensed to enrich uranium up to HALEU levels.

In 2025, Centrus announced plans for a multi-billion-dollar expansion of its uranium enrichment capacity to include large-scale production of both LEU for existing reactors and HALEU for advanced reactors that will be in demand for powering AI data centers. The Ohio facility has just 16 centrifuges today, but it has room for many additional machines, which will be manufactured in Oak Ridge. Centrus is expanding its manufacturing capacity in Oak Ridge and rapidly growing its workforce to do the job.

On Jan. 23, 2026, Centrus announced that it will invest \$567 million in the planned expansion of its centrifuge manufacturing operation in Oak Ridge, creating almost 430 jobs. As a result, Centrus will receive a portion of Tennessee's \$70 million Nuclear Energy Fund.

Touring Oak Ridge's future nuclear energy hub (part 1), *Centrus Energy, Type One Energy*

(As published in The Oak Ridger's Historically Speaking column the week of February 9, 2026)

How does uranium enrichment using centrifuges work? The uranium hexafluoride (UF₆) gas pumped into a tall, thin cylinder called a centrifuge is spun at an extremely high speed, causing the slightly heavier U-238 molecules to be flung toward the outer wall. The slightly lighter U-235 molecules stay closer to the center.

By heating the cylinder's bottom and cooling its top, a circulating current is created that pushes the gas enriched in U-235 toward one end and the depleted gas toward the other. To reach almost 20% enrichment in the UF₆ gas, it must pass through thousands of centrifuges linked together in a cascade.

Type One Energy. Our next stop was Tennessee Valley Authority's retired Bull Run Steam Plant, which for 56 years burned coal to make electricity for Tennessee residents and businesses and provided revenues to TVA. It is now the site for Type One Energy, a new company with offices headquartered in Hardin Valley in Knox County.

The company was the first recipient of a grant (\$4.5 million) from Tennessee's Nuclear Energy Fund in exchange for Type One Energy's committed capital investment of \$223.5 million for its project in Tennessee. The investment is expected to create 330 new jobs.

In January 2026, the company announced that it would establish, at TVA's newly named Bull Run Energy Complex, a facility to test materials under the intense heat that an operating fusion device would experience to determine which materials hold up the best. This materials research would be done through the company's partnership with the Department of Energy's Oak Ridge National Laboratory and the University of Tennessee. The cost of the new High-Heat Flux Facility on the new "fusion development campus" at Bull Run would be shared by DOE, the state of Tennessee, and Type One Energy.

In 2023, TVA, Type One Energy, and ORNL signed a tri-party memorandum of understanding to establish the original Project Infinity. In February 2024, Type One Energy announced its plan to relocate its headquarters to Tennessee and use the Bull Run site to build its stellarator fusion prototype machine, named Infinity One.

The startup staff is working to bring to fruition a new source of commercial electricity – fusion. In the same process that powers the sun, the nuclei of specific hydrogen isotopes combine, rather than split apart. This is unlike nuclear fission, which splits heavy atomic nuclei to power nuclear reactors and provide electricity.

As I thought whimsically, "From Bull Run to Type One," a Type One Energy representative got my attention by saying that the company is "working on a project called Project Infinity, and we are doing that in two phases, Infinity One and Infinity Two.

"Infinity One is an engineering platform, so it is not a power plant per se, but it does follow the design of the power plant." It will offer opportunities to test plant materials and components and train people to build and operate Infinity Two, he added.

He noted that the company's goal is that Infinity Two, its planned 350-megawatt fusion pilot plant, will generate power by the mid-2030s using a new building, as well as TVA's turbine building, switch yard and transmission system at the Bull Run site.

Type One Energy plans to build a fusion reactor called a stellarator, one of two types of magnetic confinement fusion reactor designs, the other being a doughnut-shaped tokamak. Both machines hold promise for generating commercial electricity by the 2030s, but Type One Energy researchers believe the stellarator technology offers important advantages.

Touring Oak Ridge's future nuclear energy hub (part 1), *Centrus Energy, Type One Energy*

(As published in The Oak Ridger's Historically Speaking column the week of February 9, 2026)

A stellarator plant relies on a complex, twisted, magnetic field from external coils to confine a superheated heavy hydrogen gas, called plasma, in which atomic nuclei fuse and release enormous amounts of steady-state, baseload energy. The captured heat turns water into steam that spins a turbine and makes electricity.

While the stellarator technology has been proven in several research platforms, no commercial stellarator power plants are currently in operation. But recent advances in supercomputing and high-temperature superconducting magnets suggest such plants may be generating electricity earlier than previously believed.

One reason for optimism is that Wendelstein 7-X (W7-X) in Germany, the world's largest and most advanced stellarator prototype, has demonstrated record-breaking plasma performance. Importantly, the former director of the W7-X stellarator in Germany is now serving as the chief technology officer at Type One Energy.

Type One Energy is one of many private fusion companies that are taking advantage of modern engineering techniques, powerful computing and improved materials to design and build various types of fusion machines. Some of these startups use magnetic confinement technology while others use more exotic approaches. The stellarator is the most advanced magnetic confinement fusion technology.

Type One Energy recently published a series of peer-reviewed physics papers that are considered the "gold standard" in commercial fusion power, according to the prestigious *Journal of Plasma Physics*. A company representative said, "The exciting news for us recently is that we signed what's called a letter of intent with TVA, and what that means is that we're working with them to chart the path for a power plant."

The representative said that the company will use deuterium (hydrogen isotopes that each have one proton and one neutron in their nuclei) in Infinity One's plasma. In Infinity Two, the company will use both deuterium and tritium (one proton and two neutrons per atomic nucleus) to power a fusion reaction. Deuterium is abundant and can be derived from seawater, but tritium is harder to find. Fortunately, the stellarator machine can breed its own supply of tritium during operation.

The tritium will be pumped continuously back into the machine's burning plasma. The fusion process generates only low-level radioactive waste that requires no long-term storage, unlike the radioactive wastes from fission reactors. Enriched uranium has a half-life of hundreds of millions of years, whereas the half-life of tritium is only 12 years! The stellarator's non-radioactive waste is helium, which is useful to scientists at ORNL and the University of Tennessee. Perhaps most importantly, the fusion reaction is incredibly safe with no risk of a meltdown or nuclear accident.

Then it was time for the bus to return to Oak Ridge Turnpike and go west for miles past the road to my house on Black Oak Ridge. The destination was a site across from the first of two relatively new industrial parks – Horizon Center and Heritage Center – in East Tennessee Technology Park. I thought about how much old, current, and new fuel types – coal, enriched uranium and deuterium-tritium plasmas – means to our city.

Next: A visit to the Orano USA site, where nuclear fuel (enriched uranium) for advanced reactors will be produced in the 2030s in Oak Ridge, and a review of Oklo, a new company planning to build the nation's first privately funded advanced nuclear fuel recycling facility in Oak Ridge.

Thank you, Carolyn, for documenting the Nuclear Science Week's "Dirt Tour" featuring several nuclear companies in Oak Ridge or planning to locate here. This is the first of a five-part series being published in Historically Speaking.

Touring Oak Ridge's future nuclear energy hub (part 1), *Centrus Energy, Type One Energy*

(As published in The Oak Ridger's Historically Speaking column the week of February 9, 2026)



The Centrus Energy complex (Courtesy of Centrus Energy)



A rendering of the future Infinity Two Fusion Pilot Plant at TVA's Bull Run (Courtesy of Type One Energy)