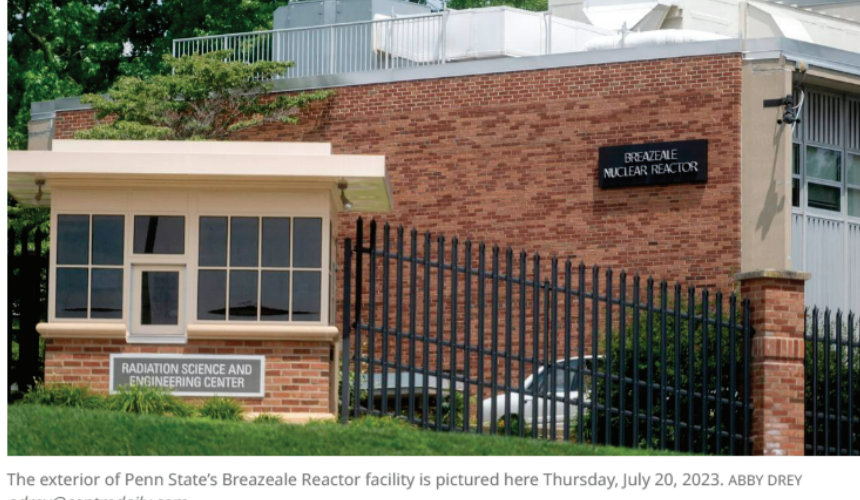


PENN STATE

# Penn State has operated a nuclear reactor in Centre County for decades. This is its history

BY MATT DISANTO

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The exterior of Penn State's Breazeale Reactor facility is pictured here Thursday, July 20, 2023. ABBY DREY

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For the first time in a long time, nuclear science is at the forefront of pop culture thanks to this summer's long-anticipated release of director Christopher Nolan's [latest acclaimed film, "Oppenheimer."](#) But in central Pennsylvania, research in the field has had a home at Penn State for decades.

Penn State's University Park campus is home to the [Breazeale Reactor](#), the United States' longest continuously operating university research reactor. It's one of the many key features that comprise the university's Radiation Science and Engineering Center, an independent unit under Penn State's vice president for research and the dean of the College of Engineering.

Locals and Penn Staters alike might be surprised to learn there's a decades-old nuclear reactor sitting in a secure facility across the street from Penn State's football complex. Today, the department helps pursue landmark research as one of the only facilities of its kind in the country.

Here's what you need to know about Penn State's Radiation Science and Engineering Center.

## ATOMS FOR PEACE

You can trace the origins of Penn State's nuclear programs back to the 1950s, when key figures like President Dwight Eisenhower and his brother, former university President Milton Eisenhower, pushed to develop nuclear facilities for research and educational purposes. The publicized movement for peaceful nuclear initiatives served as a sharp contrast from just a decade prior when, under [the Manhattan Project](#), leading experts developed the first atomic weapons toward the end of World War II.

"There really is a lot of history related to Penn State's involvement in the development of the peaceable use of nuclear power," said Dr. Kenan Ünlü, professor and director of the Radiation Science and Engineering Center.

Eisenhower, the 34th U.S. president, [delivered Penn State's commencement address](#) June 11, 1955, and reaffirmed his administration's desire to use atomic energy for peaceful applications. Eisenhower's philosophy, dubbed "Atoms for Peace," was popularized in late 1953, when he delivered a similar speech before the United Nations General Assembly.

"Power is only one of the results of nuclear fission," Eisenhower told Penn State's crowd in 1955. "Many engineers and scientists believe that radiation and radioactive isotopes may provide even greater peacetime benefit. They are already opening new horizons in medicine, agriculture, and industrial processes. Our nation has no desire for a monopoly on the knowledge and practice of these possibilities. We want the world to share —as we always have."

According to the Radiation Science and Engineering Center, Penn State trustees authorized a university project to construct a research reactor as early as 1953. Nuclear engineers William Breazeale and Robert Cochran left Oak Ridge National Laboratory to design the reactor, which was dedicated Feb. 22, 1955.

The reactor — later named after Breazeale, who would become Penn State's first nuclear engineering professor — did not immediately enter operation. The necessary uranium fuel was not available until July 1955 [after the Eisenhower administration intervened](#) on Penn State's behalf, according to the Radiation Science and Engineering Center's online archive.

Penn State received its fuel and U.S. Atomic Energy Commission license July 8, 1955, officially entering operation — or "going critical." Since then, the facilities have grown as the university pursued new avenues for research, training and education in nuclear technology. The Breazeale Reactor was even designated as a Nuclear Historic Landmark by the American Nuclear Society in 1992.

Notably, Penn State quickly became a hub for nuclear research as its reactor developed. As one of two schools participating in the International School of Nuclear Science and Engineering, Penn State attracted roughly 175 scientists and engineers from 39 countries to study in Happy Valley between 1956 and 1959 to later bring their newfound knowledge back home.

## CURRENT NUCLEAR PROGRAMS & RESEARCH

Today, Penn State's Radiation Science and Engineering Center conducts a wide range of research initiatives that are "incredible and diverse," according to its director.

"The nuclear applications touch on numerous fields in science and engineering," Ünlü said. "Many people don't realize that nuclear technology touches their lives in so many ways."

The Radiation Science and Engineering Center now comprises several facilities, including gamma-ray irradiation facilities, radiochemistry teaching laboratories, subcritical graphite reactor facilities and more on top of the Breazeale Reactor. The center [supports more than two dozen courses](#) housed in at least eight different academic colleges at Penn State, according to its website.

Current research topics are broad, Ünlü says. Some initiatives include investigations into cancer treatments, electronic components for space travel, industrial applications and microplastics. A [recent breakthrough](#) through neutron radiography — a form of non-destructive imaging — may help further microplastic research while potentially connecting decades-old debris back to missing aviator Amelia Earhart.

The university recently received a roughly \$10 million donation that will pay for new equipment and expansions for the Breazeale Reactor. The expansions, which [broke ground in late 2021](#), will help facilitate "more advanced neutron beam research" while growing nuclear engineering capabilities at Penn State.

Soon enough, new upgrades and space will help Penn State accommodate [small-angle neutron scattering technology](#), which is expected to help researchers learn how neutrons scatter when they interact with materials. The technology was donated by the Helmholtz-Zentrum Berlin institute in Germany.

Once its new equipment is up and running, the Breazeale Reactor will be the only university research reactor with small-angle neutron scattering capabilities in the U.S., Ünlü says. The new addition should help Penn State acquire additional flexibility without relying on national laboratories in [Oak Ridge](#), Tenn., or [Los Alamos](#), N.M.

"National labs, those are huge facilities. Usually, when they run, they operate continuously for a couple of months and then [take a] break," Ünlü said. "But in our case, we can run the reactor on our terms and change startup and shutdown a few times a day if it's needed. This will be an interesting learning experience for those who utilize this technique and in terms of flexibility through reactor power, changing samples and so on."

This summer, Penn State's Radiation Science and Engineering Center [joined the Nuclear Science User Facilities](#) (NSUF) as a partner institution. The U.S. Department of Energy Office program helps provide nuclear energy researchers with access to world-class facilities, expertise and research assistance. The move is expected to help Penn State continue collaborating with universities while sharing its facilities.

Facility renovations and access to new technology are helping to reaffirm Penn State's decades-old commitment to nuclear research, the center's director says.

"In terms of not just the reactor but the entire complex, Radiation Science and Engineering Center provides great resources for researchers — not just at Penn State, but those from other universities, too," Ünlü said. "We have the premier facilities in the nation, and having these types of capabilities will impact our research and education."

And although "Oppenheimer" — a biographical film documenting J. Robert Oppenheimer's quest to develop atomic weapons and grapple with their consequences — is unlikely to significantly affect today's nuclear research, it highlights some primitive concepts surrounding nuclear science and features notable organizations in the field, including the Atomic Energy Commission. It's [already a hit among cinephiles](#) and nuclear experts alike.

"It's a really factual and very well-made film," said Ünlü, who watched the film shortly after its release. "I really enjoyed myself."

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