

## 3D printed nuclear reactor components installed at TVA Browns Ferry nuclear plant

August 10 2021

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ORNL used novel additive manufacturing techniques to 3D print channel fasteners for Framatome's boiling water reactor fuel assembly. Four components, like the one shown here, were installed at the TVA Browns Ferry nuclear plant. Credit: Framatome

Four first-of-a-kind 3D-printed fuel assembly brackets, produced at the Department of Energy's Manufacturing Demonstration Facility at Oak Ridge National Laboratory, have been installed and are now under routine operating conditions at the Tennessee Valley Authority's Browns Ferry Nuclear Plant Unit 2 in Athens, Alabama.

The components were developed in collaboration with TVA, Framatome and the DOE Office of Nuclear Energy–funded Transformational Challenge Reactor, or TCR, program based at ORNL.

"Deploying 3D-printed components in a [reactor](#) application is a great milestone," said ORNL's Ben Betzler, TCR program director. "It shows that it is possible to deliver qualified components in a highly regulated environment. This program bridges basic and applied science and technology to deliver tangible solutions that show how advanced manufacturing can transform [reactor technology](#) and components."

"ORNL offers everything under one roof: state-of-the-art printing capabilities, world-class expertise in machining, next-generation digital manufacturing technologies, plus comprehensive characterization and testing equipment," said Ryan Dehoff, ORNL section head for Secure and Digital Manufacturing.

The channel fasteners' straightforward, though non-symmetric, geometry was a good match for a first-ever additive manufacturing application for use in a [nuclear reactor](#).

The current focus of the TCR program is to further mature and demonstrate industry-ready technology informed by [advanced manufacturing](#), artificial intelligence, integrated sensing and deployment of a digital platform for informed certification of components.

ORNL's broad nuclear research and development activities are directed

toward providing science and technology breakthroughs to extend the viability and operations of the nation's nuclear power plant fleet, while also accelerating the deployment of new, advanced nuclear power technologies.

"Collaborating with TVA and ORNL allows us to deploy [innovative technologies](#) and explore emerging 3D printing markets that will benefit the nuclear energy industry," said John Strumpell, manager of North America Fuel R&D at Framatome. "This project provides the foundation for designing and manufacturing a variety of 3D-printed parts that will contribute to creating a clean energy future."

"TVA is actively engaged in developing new nuclear technology for tomorrow," said Dan Stout, TVA's director of Nuclear Technology Innovation. "Partnering with ORNL and Framatome in this innovative [manufacturing](#) approach could pave the path for use across the existing nuclear fleet and also in advanced reactors and small modular reactors."

Operations at Browns Ferry resumed April 22, 2021, after a planned outage to replace a variety of components for continued safe, reliable operation and delivery of carbon-free electricity. The brackets will remain in the reactor for six years with regular inspections during that period.

Provided by Oak Ridge National Laboratory

Citation: 3D printed nuclear reactor components installed at TVA Browns Ferry nuclear plant (2021, August 10) retrieved 6 August 2024 from <https://techxplore.com/news/2021-08-3d-nuclear-reactor-components-tva.html>

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