

Nuclear Engineering Seminar

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Transformational Challenge Reactor: Leveraging Advanced Manufacturing for Reactor Design

Abstract

In the nuclear industry, a manufacturing-informed design approach has the potential to yield the most benefit from advanced manufacturing. By leveraging advanced materials, data science, and rapid testing and deployment, manufacturing-informed design can drive down costs and development times, ultimately improving future commercial viability. This approach is being demonstrated in the US Department of Energy Office of Nuclear Energy (DOE-NE) Transformational Challenge Reactor (TCR) program. The TCR program has made significant progress on development of a number of enabling technologies, including (1) a high density TRISO fuel form that leverages additive manufacturing (3D printing), and (2) an advanced moderator material (yttrium hydride), which together yield the feasibility of gas-cooled thermal spectrum systems using less than 250 kg of high-assay low enriched uranium (HALEU) and occupying less than 1 m³. This talk will showcase the ways in which advanced manufacturing is leading to more rapid design development and deployment using a number of specific examples from the DOE-NE TCR program.



Brian Ade is a R&D staff researcher within the Nuclear Energy and Fuel Cycle Division of Oak Ridge National Laboratory specializing in reactor physics analyses. He is currently leading core design and analysis for the [Transformational Challenge Reactor](https://www.ornl.gov/staff-profile/brian-j-ade) (TCR) program at ORNL. The TCR program is utilizing additive manufacturing (3D printing) for critical core components, and though this, aims to provide a revolutionary platform to dramatically reduce the deployment costs and timelines of nuclear energy systems. The program is integrating digital platforms for manufacturing, design, and qualification to enable rapid nuclear innovation. Prior to joining ORNL, he worked at Los Alamos National Laboratory as a student employee on a variety of topics including space reactor design, gas-cooled reactor research, and nuclear data. He earned B.S. and M.S. degrees in 2007 and 2010 in Nuclear Engineering from Purdue University. More information about Brian can be found at <https://www.ornl.gov/staff-profile/brian-j-ade>.