



MIPSE  
Early Career Award 2023



**Wednesday**  
**November 15, 2023**  
**1:50 pm**  
**Room 1013 Dow**

## Dr. Cami Collins

Oak Ridge National Laboratory

# Integrating Physics and Engineering for Fusion Reactor Design, Assessment, and Optimization

Remarkable advances have been made in science and technology for magnetic fusion energy, leading to construction of new devices that aim to demonstrate net energy gain. However, significant technical challenges must be overcome to reach the year-long operation timescales required for a power plant. This talk will focus on the leading concept, the tokamak, and look at next steps needed for 1) production and control of a sustained fusion plasma, 2) development of materials that can withstand the extreme fusion environment, and 3) harnessing fusion power. Sophisticated integrated modeling tools are enabling tightly coupled plasma, nuclear, and engineering predictive modeling of the fusion core, first wall, blanket, magnets, etc. Such 'virtual test beds' aim to shorten development time and guide design decisions to quickly arrive at innovative solutions that maximize the probability of meeting Fusion Pilot Plant (FPP) goals and enable optimization to impact commercial viability and timely delivery of fusion power.

**About the Speaker:** Cami Collins is a plasma physicist and section head in the Fusion Energy Division at Oak Ridge National Laboratory, where she is working to find a solution to create and sustain a burning plasma needed for an economical fusion energy pilot plant. Her specific research is in the experimental development of steady-state tokamak scenarios, and in applying integrated physics and engineering computational tools for design and assessment of fusion reactors. Cami received her Ph.D. in 2013 from the U. of Wisconsin Madison, where she received an American Physical Society Outstanding Doctoral Thesis Award for her work in laboratory plasma astrophysics. She completed a postdoc through the University of California Irvine at the DIII-D National Fusion Facility, became a staff scientist at General Atomics in 2016 specializing in spectroscopy diagnostics and energetic particle physics, and joined ORNL in 2020. Driven by a long-time passion for the success of fusion energy, she has served in multiple fusion outreach and strategic planning activities, including the APS-DPP Community Planning Process and the U.S. ITER Research Program.