Exploring new markets for advanced nuclear power technologies

Caleb S. Brooks

Department of Nuclear, Plasma, and Radiological Engineering,
University of Illinois at Urbana-Champaign

Nuclear microreactors are a new class of nuclear fission technology capable of producing up to roughly 50 MWth depending on design. Beyond their size, the primary distinguishing features over other fission systems is that microreactors are designed to be: factory built and delivered to site by truck, rail, or ship; plug-and-play with minimal onsite construction or preparation; capable of long operational periods between refueling; and minimal decommissioning required to return the site to greenfield status. Nuclear microreactors are a promising technology to enable a clean, climate conscious, energy future. The University of Illinois at Urbana-Champaign is on track to be an early site for microreactor technology through deployment of an advanced research reactor. The campus deployment focuses on the research, education, and demonstration necessary to see advanced reactor technology become widely deployable, marketable, economic, and ultimately a safe and reliable option for a clean energy future. Markets beyond centralized electricity generation are under exploration including hydrogen, ammonia, district heating, data centers, microgrids, and direct air capture. Synergistic to the feasibility of system integration are societal considerations which are explored to plot a course toward a more sustainable energy future.

Brief Bio:

Dr. Caleb Brooks is an associate professor in the Nuclear, Plasma, and Radiological Engineering Department at the University of Illinois Urbana-Champaign and a Donald Biggar Willett Faculty Scholar. He holds B.S. and Ph.D. degrees in nuclear engineering from Purdue University and has been a member of the UIUC faculty since 2014. As the Director of the Illinois Microreactor RD&D Center, his work is focused on enabling and expanding safe, peaceful uses of nuclear power. Current research activities in this Center include microreactor modeling and simulation, siting analysis, market analysis, instrumentation, operations and reactor control, licensing, and policy. Beyond his work in the Center, Dr. Brooks is also the director of the Multiphase Thermo-fluid Dynamics Lab (MTDL) which specializes in thermo-fluid dynamics of nuclear systems and reactor flows, and hybrid energy approaches for existing and future power systems. He has received the thermal-hydraulics division and society-wide young member research awards from the Atomic Energy Society of Japan, and the Landis Young Member Engineering Achievement Award from the American Nuclear Society.