EEE Research Seminar
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Sarang Supekar, Ph.D.

Principal Systems Scientist and Industrial Technologies Team Lead
Argonne National Laboratory
Lemont, Illinois

Pursuing Industrial Decarbonization and a Circular Economy: Studies of Sectoral Transformations and Novel Technologies

Abstract

To achieve the Biden-Harris administration's goal of net-zero emissions in the U.S. by 2050, the industrial sector would have to make unprecedented technological advances coupled with rapid adoption cleaner production technologies and energy sources. The U.S. Department of Energy (DOE) has identified 4 major technology advancement pillars for industrial decarbonization – energy and material efficiency, electrification, low-carbon fuels and feedstocks, and carbon capture, utilization, and storage. This talk will begin with a summary of key findings from the DOE Industrial Decarbonization Roadmap Report to Congress. This will be followed by a brief overview of select research projects from our group that align with each of the four DOE industrial decarbonization pillars, encompassing topics such as smart manufacturing for improved energy productivity, electrification of clinker (cement) production, hydrogen-blended microturbines, effect of impurities on industrial carbon capture, and recycling of end-of-life electric vehicle batteries. The talk will conclude with a brief discussion of a new optimization-based industrial decarbonization tool and accompanying foundational industrial datasets being developed at Argonne that can concurrently evaluate multiple technologies from the 4 pillars in a multi-period, multi-class stock-and-flow allocation problem to assess the economically, environmentally, and socially sound technology trajectories for decarbonizing energy and emissions intensive manufacturing industries.

Bio

Sarang Supekar is a Principal Scientist at Argonne National Laboratory, where he leads the Industrial Technologies Team at the Center for Energy, Environmental, and Economic Systems Analysis. Dr. Supekar's group conducts research on sustainable manufacturing and energy systems, with a focus on technology transitions needed for a decarbonized and circular economy. His research interests include gas-based technologies in water-intensive industries, energy systems optimization, carbon capture and utilization pathways, and critical materials recycling. His group provides strategic analysis support to the U.S. Department of Energy's Industrial Efficiency & Decarbonization and Advanced Materials & Manufacturing Technologies Offices. Dr. Supekar holds a PhD from the University of Michigan, a master's degree from the University of Florida, and a bachelor's degree from the University of Pune, all in mechanical engineering. He is the recipient of the Argonne Impact award for his role in developing the Lab's critical materials RD&D strategy, the MLK Jr. Spirit and College of Engineering Distinguished Leadership awards from the University of Michigan for his contributions to education, diversity, and inclusion initiatives, and the E. Wayne Kay Graduate Scholarship for his research on sustainable manufacturing technologies.