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Beyond hardware: Challenges and opportunities in technology assessment to support the next stage of the clean energy transition

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Abstract

Technology in the clean energy sector spans both "hardware"—the physical equipment—and "soft technology"—the processes that involve design, installation, operation, and end-of-life management, including software and analog processes. How knowledge is codified in these two forms influences the speed at which technologies spread and improve and shapes the methods suitable for technology performance assessment. For example, while hardware prices in many clean energy domains have declined rapidly worldwide, soft costs continue to vary across regions. But while hardware is a well-defined category in the energy innovation literature, with standardized assessment methods employed by industry and government agencies, there is limited research on soft technology.

This talk explores the availability and functions of soft technologies in selected clean energy domains. By synthesizing qualitative data from these areas, the talk aims to establish a foundation for classifying and advancing soft technologies. It will also discuss the suitability of existing technology assessment frameworks for evaluating and improving soft technologies. Additionally, the talk will introduce ongoing projects at the Deployment Lab, providing opportunities for students interested in research assistantships and internships.

About Our Speaker

Magdalena Klemun is an assistant professor in the Department of Civil and Systems Engineering and a member of the Ralph S. O'Connor Sustainable Energy Institute. Her research investigates how energy technologies and systems evolve in response to investments in technological innovation, with a particular focus on the relationship between technology design and performance. Klemun's work aims to support more targeted climate innovation, improve the availability of data on technology trends to inform road mapping, engineering design, and policy development, and contribute to advancing theories of technological change.

Before joining Johns Hopkins, Klemun was an assistant professor in the Academy of Interdisciplinary Studies (AIS) at the Hong Kong University of Science and Technology and a postdoctoral associate at the Massachusetts Institute of Technology's Institute for Data, Systems and Society (IDSS). Klemun earned her BS in electrical engineering and information technology from Vienna University of Technology, her MS in earth resources engineering from Columbia University, where she studied as a Fulbright Scholar, and a PhD from the Institute for Data, Systems, and Society at Massachusetts Institute of Technology.

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