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Title | Desalination for a Circular Water Economy

Abstract | Transformational changes are needed to sustain energy and water systems in the 21st century. From decarbonizing the energy sector to building a circular water economy, these systemic transitions will require large scale system redesign. At the same time, system redesign is often hindered by technological shortcomings and an absence of fundamental insight into critical processes and materials. This presentation will highlight new tools for assessing innovation needs in water desalination and discuss application of these tools within research and development portfolio design. The suite of methods we have developed are built around process-based cost optimization models and explicitly account for the dozens of nonlinearly interacting components and the possibility that innovation occurs on more than one component at a time. We apply these methods to quantify the value of innovation in four membrane desalination processes as a function of feedwater salinity, water recovery, and a cost multiplier function unique to high pressure reverse osmosis. Finally, we conclude by showing how cost-optimization models can be used to match treatment processes to feed water source and encourage research in processes where innovations can significantly increase the component cost.

Bio | Professor Meagan S. Mauter is appointed as an Associate Professor of Civil & Environmental Engineering and as a Center Fellow, by courtesy, in the Woods Institute for the Environment. She directs the Water and Energy Efficiency for the Environment Lab (WE3Lab) with the mission of providing sustainable water supply in a carbon-constrained world through innovation in water treatment technology, optimization of water management practices, and redesign of water policies. Ongoing research efforts include: 1) developing automated, precise, robust, intensified, modular, and electrified (A-PRIME) water desalination technologies to support a circular water economy, 2) addressing the water constraints to deep decarbonization by quantifying the water requirements of energy systems and developing new technologies for high salinity brine treatment, 3) supporting design and enforcement of California agricultural water policy.

Mauter also serves as the research director for the National Alliance for Water Innovation, a $110-million DOE Energy-Water Desalination Hub to address water security issues in the United States. The Hub targets early-stage research and development of energy-efficient and cost-competitive technologies for desalinating non-traditional source waters.

Professor Meagan Mauter holds bachelors degrees in Civil & Environmental Engineering and History from Rice University, a Masters of Environmental Engineering from Rice University, and a PhD in Chemical and Environmental Engineering from Yale University. She completed post-doctoral training in the Belfer Center for Science and International Affairs and the Mossavar Rahmani Center for Business and Government at the Harvard Kennedy School of Government, where she was an Energy Technology Innovation Policy Fellow.

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