

UTC INSTITUTE FOR ADVANCED SYSTEMS ENGINEERING SEMINAR SERIES

Monday April 17th, 2017

1:00 - 2:00PM

UConn, Storrs Campus – ITEB 336

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Democratizing Energy TECHNOLOGY

Do you have a billion dollars? Neither do most of the 6 million companies in the United States. In fact, less than 10 companies in the U.S. can reasonably finance a billion-dollar investment on their own. And, in the current paradigm, a billion dollars is about what you need to develop new energy technology. Whether you are using coal, biomass, biogas, or natural gas to make electricity, fuels, or chemicals; today's economic production is achieved through "economies of scale" where huge upfront capital investments are required. This high price of entry is a financial barrier that stifles all but the most incremental technological advancements. In this talk, the long-held belief in "scale-up" to achieve economic production will be challenged and "economies of number" will be proposed as an alternative to achieve cost-reductions through the development of an open modular manufacturing architecture that allows the production of many small, mass-produced modules by a multitude of vendors. Numerous advantages are offered by small-scale, modular systems over large-scale deployment, including: 1) less upfront capital, no down time, and less risk; 2) faster market response and adaptable output; 3) the creation of deployable assets (no sunk capital); 4) access to remote resources/assets; 5) better integration resulting in less waste; 6) access to new capital resources and consumer markets; and 7) faster innovation through more players and a lower barrier to experimentation. However, simply reducing the size of an existing process alone will not be sufficient to realize the benefits of mass production—innovations are required. Fundamentally, there are two key technical challenges to operating processes at small-scale: 1) high surface-to-volume ratio prevents near-adiabatic operation and 2) common gravity-based processes (separations) at small-scale may not yield sufficient residence times. These challenges and overall production efficiency will require innovations in process intensification that dramatically reduce the process volume, capital, and/or environmental footprint per rate of production and the development of an open modular architecture platform. Recent advances, emerging opportunities, and challenges ahead in "democratizing" energy conversion technology will be discussed.

Dane A. Boysen

Dr. Boysen is dedicated to mentoring hard-tech innovators through critical technology and commercialization challenges at Cyclotron Road—a lab-embedded mentorship program at Berkeley Lab. Before this, Dr. Boysen served as the Executive Director for Research Operations at the Gas Technology Institute (GTI) where he led an initiative on developing small-scale, modular solutions for monetizing flared and stranded natural gas. Boysen also served as a Program Director at the Advanced Research Projects Agency-Energy (ARPA-E), where he managed over \$100 million spread across 34 of the nation's most cutting-edge energy technology R&D projects. Before joining ARPA E, Boysen led an \$11 million R&D project to develop liquid metal batteries for grid-scale energy storage at the Massachusetts Institute of Technology. In 2005, Boysen co-founded the venture capital-backed company Superprotonic Inc. to commercialize his pioneering work in solid acid-based fuel cells. Boysen received his Doctorate (2004) in Materials Science from the California Institute of Technology.

Upcoming Distinguished Lectures

5/08/17 – Ignacio Grossmann
Challenges in the Application of
Mathematical Programming
Approaches to Enterprise-wide
Optimization of Process Industries

Upcoming Seminars

5/22/17 – James Davis

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