EPSTEIN INSTITUTE SEMINAR ISE 651

ROLE OF PROCESS SYSTEMS ENGINEERING IN DECARBONIZATION AND ENERGY TRANSITION

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ABSTRACT

This seminar will delve into the critical role of process systems engineers in steering society toward sustainability, focusing on the energy transition and achieving carbon neutrality. The shift towards renewable energy sources presents a colossal challenge, anticipated to span several decades. Carbon capture, storage, and utilization (CCUS) are considered pivotal interim solutions to mitigate carbon emissions during this transition. Our discussion will center on evaluating various CCUS technologies in terms of economic viability and their capacity to significantly reduce CO_2 emissions. We will analyze material and energy flows across different CCUS technologies using a superstructure approach, assessing their economic merits and CO_2 reduction capabilities through techno-economic assessment (TEA) and life cycle analysis (LCA). Key parameters and limitations impacting CO_2 reduction efforts will be identified and explored.

We will introduce a specialized software, ArKaTAC3, designed to streamline the evaluation process and pinpoint optimal CCUS strategies. Through case studies, we aim to provide both qualitative insights and quantitative data to inform decision-making and policy formulation. The seminar will further explore the spatial-temporal aspects of renewable energy generation and utilization in CCU and green hydrogen production, discussing strategies for their effective deployment over the forthcoming decades. This presents a complex decision-making scenario, spanning multiple scales and stages, which we plan to address using a blend of traditional optimization techniques and modern machine learning approaches, including reinforcement learning.

SPEAKER BIO

Jay H. Lee received his Ph.D. degree in Chemical Engineering from Caltech in 1991. After having been a faculty member of various universities, including Auburn, Purdue, Georgia Tech, and KAIST, he is currently a Choong Hoon Cho Chair and Professor of Mork Family Department of Chemical Engineering and Materials Science at University of Southern California (USC). From 2013-2023, he served as the founding director of Aramco-KAIST CO2 Management Center. He is a Fellow of IEEE, IFAC and AIChE. He is a recipient of many awards including NSF Young Investigator Award, AIChE's Computing in Chemical Engineering Award, and Roger Sargent's Lectureship. He published over 250 manuscripts in SCI journals with more than 20000 Google Scholars citations (with h-index of 66). His research interests are in the areas of model-based control and machine learning with applications to energy transition and sustainability.

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