



CHE-PETE SEMINAR SERIES

Integrated Safer Design and Risk and Reliability Analyses for Process and Integrated Energy Systems

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Ensuring the safety, reliability, and economic viability of energy systems' production, storage, delivery, and end-use is a top priority across different energy industry sectors. Quantitative and qualitative risk assessment methodologies have contributed to the continuous improvement of the economic and safety records of the critical energy systems and their supply chain, including process plants, pipelines, and refueling stations. As the energy industry transitions towards a more sustainable future by integrating sustainable, carbon-neutral alternatives across all sectors of system lifecycle, there is a need for a rigorous evaluation of the safety and economic viability of these alternatives. This research seminar will cover activities focused on addressing uncertainties in risk and reliability assessment of energy systems critical to national and global energy security. One of the directions is to integrate AI/ML methods with multi-criteria decision-making (MCDM) approaches to rank alternative process design pathways. In addition, the development of integrated safety, reliability, and economic assessment for nuclear-integrated electrolytic hydrogen production will be discussed. This work is funded by the Department of Energy-Office of Nuclear Energy in its effort to create efficient, affordable, reliable energy generation and delivery technologies in the U.S. Also, I will discuss efforts to leverage reports by the U.S. Chemical Safety Board (CSB) to learn from industrial accidents involving hazardous chemicals to enhance our understanding of flammability and explosion risks in enclosed process building. Finally, I will present work aimed at enhancing our understanding of the human aspects involved in systems safety and risk assessment through the development of model-based approaches to qualitatively and quantitatively assess human reliability analysis (HRA).

ENGINEERING NORTH 450

APRIL 7 | 3-4PM

Ahmad Al-Douri is an assistant professor in the School of Sustainable Chemical, Biological, and Materials Engineering (SCBME) at the University of Oklahoma. He earned his Ph.D. from Texas A&M University in 2021, where he was awarded the Phillips 66 Technical Fellowship. Dr. Al-Douri's research focuses on the development of methodologies to address the nexus of process systems safety/risk/reliability and process systems engineering. He has authored or co-authored more than 24 peer-reviewed research publications in the areas of process safety, quantitative risk assessment, and process design and integration. He has participated in research projects funded by the Department of Energy and the Electric Power Research Institute, including as a co-PI on a \$1 million grant from the Department of Energy-Nuclear Energy University Program. He has also collaborated on a number of cross-disciplinary projects with researchers from the National Renewable Energy Laboratory (NREL), the University of California-Los Angeles, and industry.

