

**A Multi-Scale Energy Systems Engineering Approach
Towards *Optimal Energy, Mobility, Process & Materials*
Transition Strategies**

Professor Stratos Pistikopoulos
Director, Texas A&M Energy Institute
Dow Chemical Chair
Artie McFerrin Department of Chemical Engineering
Texas A&M University

Multi-scale Energy Systems Engineering provides a methodological, generic framework to arrive at realistic integrated solutions to complex energy problems by adopting a holistic, systems-based approach. This framework aims to address the complex energy and environmental problems existing in design, control and operation of energy and process systems, and their supply chains in an integrated manner, by producing optimal design and operational plans for systems ranging from nanoscale, micro-scale, meso-scale to mega-scale levels over horizons that range from milliseconds to months or years.

Methodologies in multi-scale energy systems engineering include superstructure optimization with high-fidelity & data-driven models, mixed integer optimization strategies, integrated material and process design, control & operations under uncertainty, and life-cycle and sustainability assessment. Such a holistic approach is particularly powerful to analyze future scenarios towards establishing viable and business-sensible energy transition strategies, which take systematically into consideration the energy-process-mobility-materials interactions within a value and supply chain perspective. The seminar will illustrate the concepts and methods of such an integrated modeling strategy by its application to (i) the synthesis of operable process intensification and modular systems (the RAPID SYNOPSIS project) toward step-change energy efficient and cost reduction solutions, and (ii) a renewable resources utilization framework focusing on the production & delivery of hydrogen-based Dense Energy Carriers toward electrification, where issues related to intermittency and geographical variability, storage options and transportation will be addressed.

Professor Stratos Pistikopoulos PhD FIChemE FAIChE FREng



Professor Pistikopoulos is the Director of the Texas A&M Energy Institute and holds the Dow Chemical Chair Professorship in the Artie McFerrin Department of Chemical Engineering at Texas A&M University. He was a Professor of Chemical Engineering at Imperial College London, UK (1991-2015) and the Director of its Centre for Process Systems Engineering (2002-2009). He holds a Ph.D. degree from Carnegie Mellon University and he worked with Shell Chemicals in Amsterdam before joining Imperial. He has authored or co-authored over 500 major research publications in the areas of modelling, control and optimization of process, energy and systems engineering applications, 10 books and 3 patents. He was a co-founder of Process Systems Enterprise (PSE) Ltd, a Fellow of AIChE and IChemE and the current Editor-in-Chief of Computers & Chemical Engineering. He is a past Chair of the Computing and Systems Technology (CAST) Division of AIChE and served as a trustee of the Computer Aids for Chemical Engineering (CACHE) Organization (2014-2019). Prof. Pistikopoulos was a co-recipient of the prestigious MacRobert Award from the Royal Academy of Engineering in 2007, the recipient of the Computing in Chemical Engineering Award of CAST/AIChE in 2013, the IChemE's Sargent Medal in 2020, and the AIChE's Sustainable Engineering Forum Award in 2021. He received the title of Doctor Honoris Causa from the University Politehnica of Bucharest in 2014, and from the University of Pannonia in 2015. He was elected a Member of the Academy of Medicine, Engineering and Science of Texas (TAMEST) in 2021. In 2013, he was elected Fellow of the Royal Academy of Engineering in the UK.

