

## Optimization and energy systems engineering

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Energy systems engineering problems are oftentimes complicated by factors like large amounts of uncertainties and multi-scale nature of decisions. This presentation examines the role of optimization in energy systems engineering and the complications that arise, particularly those that arise from the coupling between long-term planning decisions like capital investment and policy and shorter-term decisions like production capacity operation and logistics. The talk starts with the discussion of a simple two-stage stochastic program that addresses optimization of an energy supply chain in the presence of uncertainties. The discussion then moves on to a more complex multi-stage, multi-scale stochastic decision problem in which periodic investment / policy decisions are to be made on a time-scale orders of magnitude slower than that of operating decisions. Approximate dynamic programming is proposed as a promising algorithmic strategy to handle such challenges.