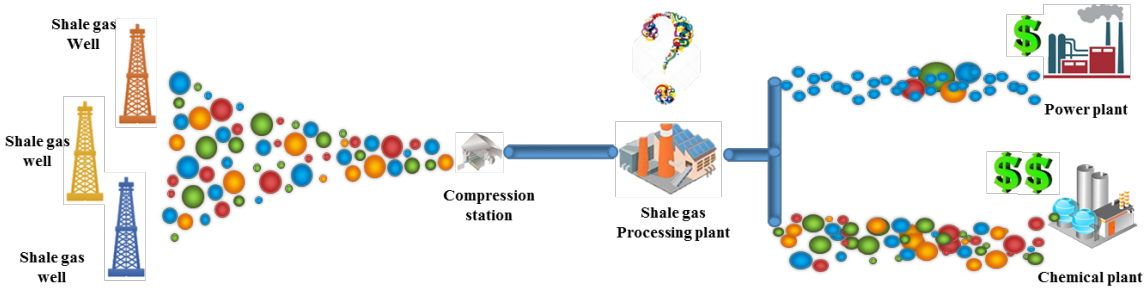
Natural Gas Energy Systems Analysis and Design through Big-Data Driven Optimization

Dr. Fengqi You, Roxanne E. and Michael J. Zak Professor
Process-Energy-Environmental Systems Engineering
fengq.you@cornell.edu | you.cbe.cornell.edu

The "shale revolution" has stimulated tremendous production of unconventional natural gas (e.g. shale gas). The industry is undergoing a rapid growth to provide energy and chemical products to the U.S. and global market. Conventional energy systems and process design using deterministic input parameters and conduct sensitivity analysis of uncertain parameter to validate the designs. Yet, raw shale gas from various shale plays is subject to different compositions. A natural gas processing plant designed under a fixed composition would produce a large amount of off-spec products if the real feed composition deviates from the designed one. The growing amount of shale gas composition data and recent advances in machine learning algorithms provide a powerful approach to address this challenge.



In this project, we aim to develop a new energy systems design strategy to account for composition variability from gas production wells and economics of shale gas processing plants. Large amount of real region-wide shale gas composition data collected from the wells will be analyzed, and typical patterns will be recognized based on machine learning methods. The big data analytics task will provide useful information for the subsequent process design task, and these two parts will be organically integrated to address the composition uncertainty.