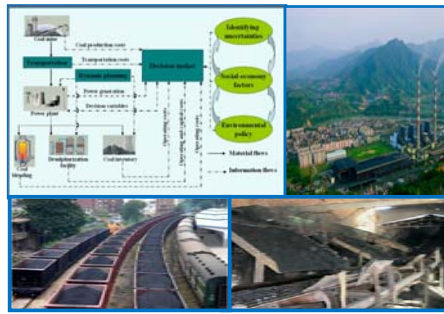


Study on Coupled Coal and Power Management(CCPM) Systems under Uncertainty

In the face of the special contradictions between the coal and electricity industry in China, coupling coal and power production in an economical and environment-friendly manner is necessary and imperative to eliminate conflicts and promote energy development. Liu's efforts are focusing on planning of coupled coal and power management (CCPM) systems through the integration of inexact programming techniques to (a) identify the desired energy policy and pollution control scheme under uncertainty; (b) satisfy the requirements for operation and management; (c) provide decision support for making forward-looking, systematic and scientific strategies.

Analysis and Modeling of the CCPM Systems

- Analyzed of the typical structure and composition of CCPM systems, and dug and summed up the complex features of the system.
- An optimization model for the coupled coal and power management system is firstly developed.



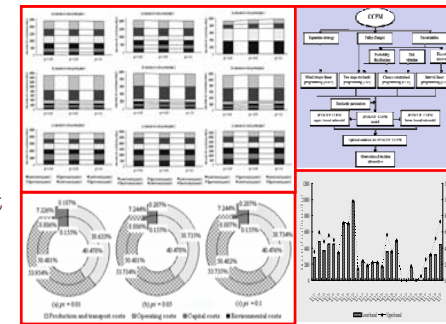
Studies on CO₂ Emission Reduction and Ecological Restoration for CCPM Systems

- A series of inexact optimization models are developed for supporting coupled management of CCPM systems with the consideration of CO₂ emission reduction and ecological restoration under uncertainty.
- Scenarios analysis is conducted to examine the optimal CO₂ emission mitigation and ecological restoration schemes for the CCPM systems which were forced to comply with given CO₂ emission control and ecological environment protect targets.



Development of Inexact Optimization Models for CCPM Systems under Uncertainty

- Facilitate in-depth analysis of the complicated uncertainties and interactive factors, and screen out the prominent and typical management problems in the CCPM system.
- Through integrations of multiple inexact techniques, a series of inexact coupled coal and power management models are proposed to improve the scientificness and accuracy of decision-making under uncertainty.



Case studies of CCPM Systems in North China

- The studies have been applied to a real case of long-term coupled coal and power management systems planning in north China.
- Energy mechanisms of coal production and allocation, capacity installation and expansion, power generation, and coal blending under various social-economic, environmental and system-reliability constraints with a maximized system reliability, a maximized energy security and maximized economic and environmental benefits.

