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**Abstract** Fossil fuel generation companies (GenCos) trade in multiple uncertain energy markets: fuel and carbon markets on upstream side while electricity market on downstream side. Global economic and environmental benefits lead these markets to pursue overlapping goals, making them highly interactive. GenCos may identify optimal trading strategies for upstream and downstream trading in an integrated framework, to manage an overall secure and profitable position. Further, severe unpredictability of energy market prices may necessitate a GenCo to make trading plans which perform better meeting its goals. Under severe uncertainty of involved markets, this paper proposes Information Gap Decision Theory (IGDT) based approach to select three interrelated trading portfolios, in an integrated framework. Results from a realistic case study provide a comprehensive decision insight to address risk-averse and risk-seeking behavior of GenCo, explicitly highlighting importance of co-variation in prices of interactive markets.

**Keywords** Congestion uncertainty, emission permit, fuel, information gap decision theory, portfolio optimization.