ID de Contribution: **251** Type: **Contributed talk**

Optimizing multi-energy bids: a stochastic tri-level approach

vendredi 1 août 2025 11:45 (30 minutes)

In modern energy systems, electricity and natural gas markets are increasingly interdependent due to the prominent role of gas-fired power generation, which provides essential flexibility to balance the variability of renewable energy sources.

In such a context, this work presents a tri-level optimization model to address the optimal bidding problem faced by a price-maker electricity producer participating in both the day-ahead electricity and gas markets.

The producer, operating a diversified generation portfolio that includes gas-fired units, engages in both markets by purchasing natural gas as a fuel input and selling electricity across various generation technologies.

The upper level problem models the producer's profit-maximization strategy, while the lower levels simulate the market clearing processes for gas and electricity, respectively.

Uncertainty in key parameters - such as demand, renewable generation, and competitor behavior - is captured through a stochastic formulation of the problem.

To address the computational complexity arising from the complexity and stochastic nature of the model, we employ neural network-based surrogate models to approximate market clearing outcomes.

Preliminary findings confirm the capability of the proposed model to capture complex intermarket dynamics and support more robust bidding strategies in multi-energy environments, while ensuring computational tractability through neural network-based approximations.

Author: RENDE, Alessandra (Department of Mechanical, Energy and Management Engineering, University of Calabria, Italy)

Co-auteurs: Prof. RUIZ MORA, Carlos (Department of Statistics, Universidad Carlos III de Madrid); Prof. BERALDI, Patrizia (Department of Mechanical, Energy and Management Engineering, University of Calabria, Italy)

Orateur: RENDE, Alessandra (Department of Mechanical, Energy and Management Engineering, University of Calabria, Italy)

Classification de Session: Application in energy, finance or logistics

Classification de thématique: Applications in energy, finance or logistics