Università di Brescia

Department of Economics and Management

WORKSHOP IN

Optimization Models for Energy Economics

Date **May 21, 2026**

Room A5, Contrada Santa Chiara

Program

09.30 Welcome

09: 40 **Antonio J. Conejo**, *The Ohio State University, USA*

Talk: "Optimization and Complementarity Problems in the Energy Sector"

This presentation provides an overview of optimization and complementarity techniques relevant to the energy sector. We consider first large-scale mixed-integer optimization problems whose solution requires decomposition techniques. These problems are relevant for short-term scheduling under uncertainty and for long-term investment decisions. Next, we consider complementary problems that are ubiquitous in energy markets, including equilibrium problems, bi-level problems, and equilibrium problems involving bi-level problems. Finally, we consider min-max-min problems that play a key role in ensuring protection against natural and man-made disasters.

10.40 **Miguel Carrión Ruiz Peinado**, *Universidad de Castilla - La Mancha, Spain*

Talk: "Bilevel Modeling of Generation Capacity Investment with Cost Recovery"

Increasing levels of variable renewable energy introduce significant complexities in optimal generation capacity planning. One of the main challenges is the profit cannibalization effect caused by the integration of a large number of renewable generators with low operating costs, which may prevent new generators from recovering their fixed costs. This work proposes a capacity investment model based on a bilevel formulation that considers reliability options for dispatchable units to ensure total system cost recovery. Simulation results indicate that both capacity expansion decisions and generator profitability depend on the selected cost recovery framework.

11.40 **Álvaro García Cerezo**, *Universidad de Castilla - La Mancha, Spain*

Talk: "Day-ahead market scheduling strategy of a virtual power plant under the single imbalance pricing scheme via stochastic robust optimization"

The high integration of renewable energy technologies in power systems represents a challenge due to the uncertainty in their production. In most European markets, producers should comply with their scheduled operation or face the penalties imposed through an imbalance mechanism. Renewable energy sources can be coordinated along with other technologies within a virtual power plant to mitigate the imbalance penalties. To mitigate this issue, in this paper a day-ahead market scheduling strategy of a virtual power plant under the single imbalance pricing scheme is determined using a novel two-stage formulation. Novelty of this work lies in the combination of scenario-based stochastic programming and robust optimization to model uncertainty in the imbalance price deviations. The presented case study is based on data from the Croatian power system.