Workshop on Energy Flexibility in Smart Buildings and Smart Grids

10 December 2021,

Instituto Superior de Engenharia do Porto,

Porto, Portugal

A New Bi-Level Formulation Method for Optimal Bidding in Local Electricity Markets

Zahra Foroozandeh

Research Group on Intelligent Engineering and Computing for Advanced Innovation and Development (GECAD)

Type of talk: Invited talk

Abstract:

In This research work, a new bi-level formulation for pricing electricity power in a Local Electricity Market (LEM) is presented in which the upper-level problem maximizes (minimizes) the producer's profits (consumer's cost), and the lower-level problem is a linear convex assignment problem that determines the traded energy amount. For solving the proposed model, the lower-level problem is replaced by its corresponding Karush-Kuhn-Tucker conditions. The bi-level problem is converted to a single-level optimization. The main advantages of the model are: (1) The merit order procedure is formulated by algebraic constraints for determining clearing-price, such that they can consider the constraints of the upper-level problem. (2) The proposed method is implemented efficiently and obtains accurate and reliable results. (3) The model leads to fair benefits among agents who are attending the LEM. These advantages are illustrated in two case studies. The results suggest 9%-15% cost reduction compared to the previously reported value in the literature.

Related References:

[1] Lezama, F., Soares, J., Faia, R., Vale, Z., Kilkki, O., Repo, S., & Segerstam, J. (2021). Bidding in local electricity markets with cascading wholesale market integration. International Journal of Electrical Power & Energy Systems, 131, 107045.

[2] Lezama, F., Soares, J., Faia, R., Faria, P., & Vale, Z. (2021, September). Bidding in Local Energy Markets Considering Uncertainty from Renewables and Demand. In 2021 IEEE International Conference on Environment and Electrical Engineering and 2021 IEEE Industrial and Commercial Power Systems Europe (EEEIC/I&CPS Europe) (pp. 1-6). IEEE.