Effect of the adoption of "EUPHEMIA" algorithm in the Greek day-ahead electricity market

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The implementation of a European Energy Union, is one of the ten priorities of the European Commission over the period 2015-2019[1]. It aims at delivering secure, affordable and clean energy for EU citizens and businesses by allowing a free flow of energy across national borders within the EU. An important pillar of the implementation of the Energy Union is the integration of European electricity markets, through the market coupling of interconnected systems. Price Coupling of Regions (PCR, 2010), a project of European Power Exchanges has led to the development of a single price coupling algorithm, EUPHEMIA which stands for the Pan-European Hybrid Electricity Market Integration Algorithm (EUPHEMIA, 2016).

Member states have incorporated EUPHEMIA as the algorithm for solving their day-ahead electricity markets, facilitating market coupling among national day-ahead electricity markets. The Greek parliament has recently adopted an Energy Act that establishes an Energy Exchange, where the EUPHEMIA model will be adopted for the operation of the day-ahead electricity market, replacing the mandatory pool where the existing wholesale electricity market is organized, based on a unit-commitment model that co-optimizes energy and ancillary services. The existing model of the Greek electricity market has been thoroughly examined by the authors, concerning its short-term, medium-term and long-term perspective (Dagoumas et. al., 2017, Dagoumas and Polemis, 2017, Koltsaklis et. al., 2014; 2016; 2017).

The EUPHEMIA algorithm is already used in several power exchanges to calculate electricity prices across Europe respecting the capacity of the relevant network elements on a day-ahead basis, maximizing the overall welfare and increasing the transparency of the computation of prices and flows. This paper aims at examining the effects of the adoption of the EUPHEMIA algorithm in the Greek day-ahead electricity market. More specifically, it examines different scenarios concerning the different products included in the Pan-European Hybrid Electricity Market Integration Algorithm (EUPHEMIA). More specifically in a running economic dispatch model that the Energy & Environmental Policy laboratory operates, different types of orders of the EUPHEMIA algorithm have been incorporated and examined, such as: hourly orders, block orders, flexible blocks and complex orders with minimum income condition. Moreover, the paper, examines different scenarios concerning the impact of minimum variable cost restriction on offers by producers, as well as different bidding strategies by market participants, depending on the conditions of the day-ahead market. A sensitivity analysis in implemented to examine the effect of demand evaluation, penetration of renewables, commission and decommissioning of generating units. Results provide useful insights for the effect of the EUPHEMIA algorithm on the Greek day-ahead electricity market.

[1] https://ec.europa.eu/commission/priorities/energy-union-and-climate_en

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