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Dynamic pricing in the energy sector: A Systematic review of models and research trends

Dimitris Folinas, Aristoteles Mavidis, Giannis Kostavelis, Naoum Tsolakis, Maria-Theodora Folina, Charisios Achillas, Dimitrios Aidonis,*

Abstract

Dynamic pricing in electric energy systems has emerged as a critical tool for promoting flexibility, efficiency, and sustainability in modern electricity markets. This study provides a comprehensive investigation into the conceptual and methodological evolution of dynamic pricing, focusing on its application in the context of energy transition, demand-side management, and digitalisation. Employing the PRISMA framework, a systematic literature review was conducted on 1,279 Scopus-indexed publications from 2017 to 2025. This dataset was further analysed through bibliometric techniques using the Biblioshiny interface of Bibliometrix, enabling the identification of key research streams, co-occurrence networks, and thematic clusters. The analysis reveals two dominant logics: one grounded in economic optimisation and market regulation, and another in systems engineering and algorithmic modelling. A taxonomy of pricing schemes is developed, followed by a comparative evaluation of their efficiency, scalability, and user acceptance. The paper also reviews modelling approaches including machine learning, game theory, and agent-based simulations, along with selected case studies that illustrate real-world applications in electric vehicles, microgrids, and peer-to-peer markets. The findings highlight both the technological and behavioural dimensions of pricing design and offer recommendations for policy and future research. Ultimately, the study contributes to a more integrated understanding of how dynamic pricing can support resilient and responsive energy systems.

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