

Collaborative Energy Optimization for Multi-Microgrid Distribution System Based on Two-Stage Game Approach

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Abstract : Efficient energy management in multi-microgrid distribution systems holds significant importance for enhancing the economic benefits of regional power grids. To better balance conflicts among various stakeholders, a two-stage game-based collaborative optimization approach is proposed in this paper, effectively addressing the realistic scenario involving both competition and collaboration among stakeholders. The first stage, aimed at maximizing individual benefits, involves constructing a non-cooperative tariff game model for the distribution network and surplus microgrid. In the second stage, considering power flow and physical line capacity constraints we establish a cooperative P2P game model for the multi-microgrid distribution system, and the optimization involves employing the Lagrange method of multipliers to handle complex constraints. Simulation results demonstrate that the proposed approach can effectively improve the system economics while harmonizing individual and collective rationality.

Keywords : cooperative game, collaborative optimization, multi-microgrid distribution system, non-cooperative game

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