Research on Intelligent Bidding Strategy for Distributed Electricity Trading in the Day-Ahead Market

Zhang Yonghong
Doctoral Student, School of Cyberspace Security, Southeast University, Dhaka, Bangladesh

Li Shouwei *
Professor, School of Economics and Management, Southeast University, Dhaka, Bangladesh

Zhang Jiazheng
Doctoral Student, Southeast University, Dhaka, Bangladesh

Abstract

With the development of distributed power systems, the consumption of distributed energy has become a major challenge in the electricity market. To address this issue, a multi-agent reinforcement learning (ATT-MADDPG) bidding strategy based on attention mechanism is proposed for electricity pricing in the day ahead market. By introducing a bilateral auction mechanism and modeling the bidding process as a Markov game model, the intelligent agent simulates bidding using predicted information on electricity supply and demand. After repeated training to optimize the bidding strategy, it eventually converges to the equilibrium price, thereby optimizing the day ahead trading plan. The simulation results using photovoltaic power generation as an example show that the ATT-MADDPG algorithm outperforms the MADDPG algorithm in terms of convergence and overall user utility, with trading volumes increasing by 50% and 43% respectively compared to random quotes and MADDPG. This result indicates that the ATT-MADDPG algorithm can effectively promote the consumption of distributed energy and optimize the allocation of power resources while improving the overall revenue of users.

Keywords

Day-ahead market; Distributed power; Multi agent reinforcement learning; Attention mechanism; Bidding strategy.