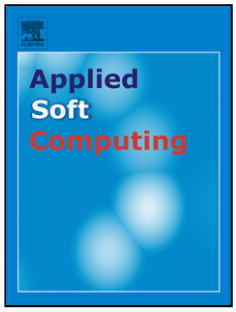

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Author: Kai Ma Shubing Hu Jie Yang Xia Xu Xinping Guan

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Appliances Scheduling via Cooperative Multi-Swarm PSO under Day-Ahead Prices and Photovoltaic Generation

Kai Ma[a], Shubing Hu[a], Jie Yang[a,*], Xia Xu[a], Xinping Guan[b]

[a]*School of Electrical Engineering, Yanshan University, Qinhuangdao, 066004, China*
[b]*Key Laboratory of System Control and Information Processing, Ministry of Education, Department of Automation, Shanghai Jiao Tong University, Shanghai 200240, China*

Abstract

This work studies the problem of appliances scheduling in a residential unit. An appliance-scheduling model for the home energy management system (HEMS) is established based on day-ahead electricity prices and photovoltaic (PV) generation. The HEMS receives the meter data and calculates the scheduling strategies, then the HEMS sends control signals to achieve the on/off control of the appliances through the ZigBee (a wireless communication technology with low power consumption in short distance). The study starts with a view to minimizing the summation of the electricity payments, the consumer's dissatisfaction (DS), and the carbon dioxide emissions (CDE), and the constraints specify the restrictions on the operating time and the power consumption of the appliances. A cooperative multi-swarm particle swarm optimization (PSO) algorithm is adopted to solve the combinational optimization problem. The appliances can be categorized into shiftable and non-shiftable appliances. For the shiftable appliances, the start time and power of the appliances can be scheduled flexibly in the case of the announced electricity prices. Furthermore, the plug-in hybrid electric vehicle (PHEV) is introduced to charge or discharge for energy management. Specially, the ability of selling electricity (SE) to the power grid is studied for appliances scheduling. Finally, the simulation results demonstrate that the cooperative

*Corresponding author. Tel.: +86 03358047169.
Email addresses: kma@ysu.edu.cn (Kai Ma), shubingdf@163.com (Shubing Hu), jyangysu@ysu.edu.cn (Jie Yang), xuxiajnz@163.com (Xia Xu), xpguan@sjtu.edu.cn (Xinping Guan)