Supplementary Material for "Resilient energy management strategy in smart residential buildings considering price attack: An aggregative game perspective"

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In the supplementary material, we give the variational equilibrium analysis of game and the detailed information of the numerical examples in the paper "Resilient energy management strategy in smart residential buildings considering price attack: An aggregative game perspective".

I. Simulation Setting

For the convenience of validating the proposed system,we propose the following hypothesis:

1) The battery capacity is sufficiently large to support the daily usage of the smart buildings without the need to consider battery charging and SOC issues. However, the battery's discharge capability is limited to a maximum of 10 kWh per hour in this paper.
2) The electric vehicle fleet consists of homogeneous vehicles, meaning that the parameters of the electric vehicles are identical.

Although the above assumptions are made, they can be relaxed and the methodology can be extended to a wider range of scenarios. The following content is the setting of the parameters required for the simulation of the proposed system.

A. Parameter setting for RESs

Each smart building is equipped with rooftop solar PV panels, wind turbine. The specifications for RESs are listed in Table S1. Figure S1 displays the total power output from renewable power generation over a day.

TABLE S1. RESs Specifications.

No	Component	Rated	Count	Total Rated
1	Wind turbine	1.5 kW	3	4.5 kW
2	Solar PV	0.1 kW	30	3 kW

B. Parameter setting for V2B

A smart building is equipped with a fleet of 10 homogeneous EVs that possess V2B capabilities. It is assumed that these vehicles are capable of arriving at the building and engaging in V2B operations between hour 18 and hour 21. The charging and discharging parameters of the electric vehicles are depicted in Table S2, while Figure S2 illustrates the number of electric vehicles (EVs) arriving at the building for Vehicle-to-Building (V2B) operations during the specified schedule. The arrival pattern of these EVs follows a normal distribution, which is characterized by a symmetric bell-shaped curve. This distribution indicates that most EVs arrive around a central peak time, with fewer vehicles arriving during the early and late hours of the schedule.

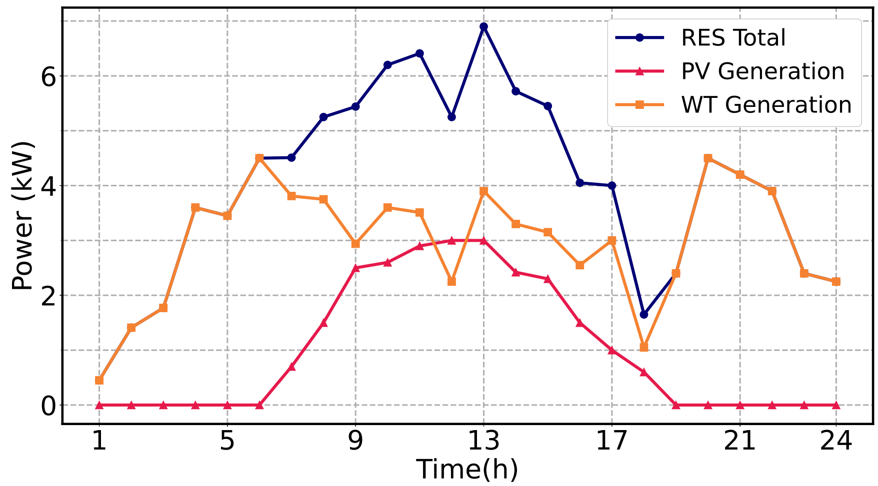

Fig. S1. Power generation of solar PV and WT systems over a day.

TABLE S2. EV Specifications.

Storage Capacity	Charge Power	Discharge Power
30 kWh	2.5 kW	2 kW

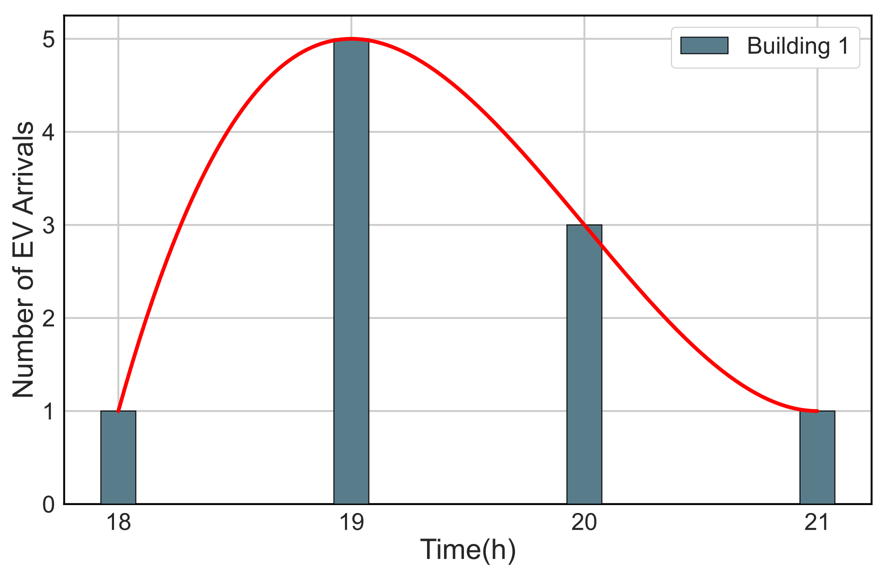

Fig. S2. Number of EV arrivals in each smart building.

C. Parameter setting for cost

Maintenance costs for batteries, denoted as $C_{\mathrm{d},1}$ and $C_{\mathrm{d},2}$, are set at $1\$/\mathrm{kWh}$ and $0.3\$/\mathrm{kWh}^2$ for BESS, and $1\$/\mathrm{kWh}$ and $0.5\$/\mathrm{kWh}^2$ for EVs, respectively. Coefficients for satisfaction cost associated with building electricity consumption, denoted as $\omega_{i,1}$ and $\omega_{i,2}$, are fixed at $0.5\$/\mathrm{kWh}$ and $0.1\$/\mathrm{kWh}^2$, respectively. For the dynamic electrical price parameter, $\lambda(t)$ and μ are set to $0.1\$/\mathrm{kWh}$ and $0.002\$/\mathrm{kWh}^2$, respectively.