Supporting Information

Optimal Configuration and Planning of Distributed Energy Systems Considering Renewable Energy Resources

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Table S1. Types of the Installed Technologies in Each Node

Nodes	Types						
	PV	EC	AC	Geothermal	CHP	Boiler	ST
1		✓	✓	✓			
2	✓	✓	✓		✓	✓	✓
3	✓	✓	✓		✓	✓	✓
4		✓	✓	✓			
5		✓	✓	✓			
6	✓	✓	✓		✓	✓	✓

Table S2. Candidate Boiler Technologies

Boiler Technologies	Capital Investment Cost ($/kW)	Boiler Capacity (kWh)
Combi boilers	2,600	214
Heat only (regular boilers)	6,700	245
System boilers	3,800	213

Table S3. The Penalty Costs of Unmet Heat, Cool, Electrical Demand, and Carbon Emissions

Parameters	Value ($/kWh)
Penalty cost for unmet heat demand (Pen^H)	2
Penalty cost for cool unmet demand (Pen^C)	3
Penalty cost for unmet electrical demand (Pen^E)	2
Amount of emission penalty (Pen^{CA})	800

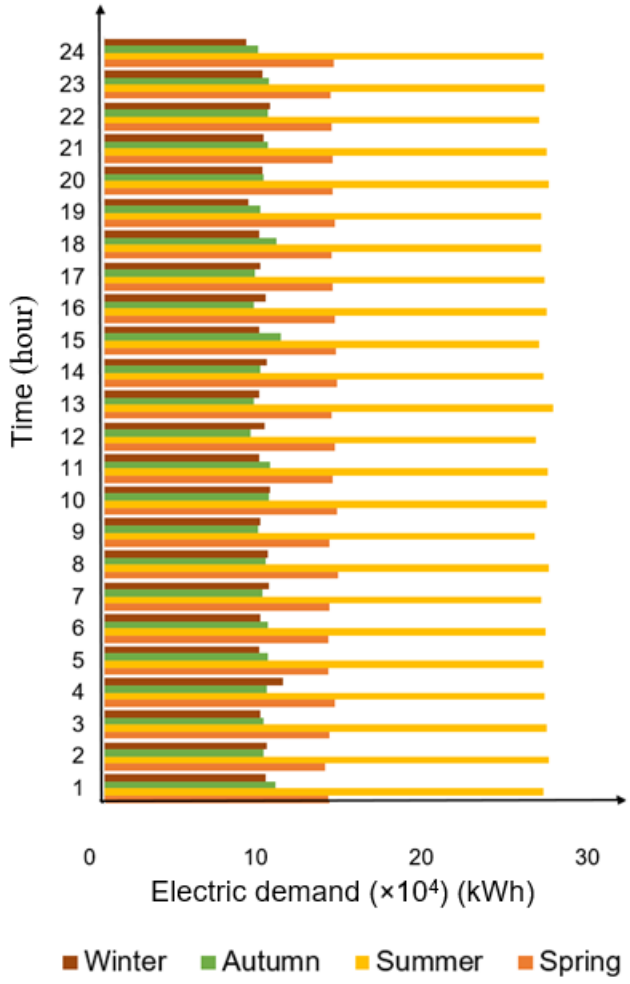

Figure S1. Electricity demand and peaks in the second year.

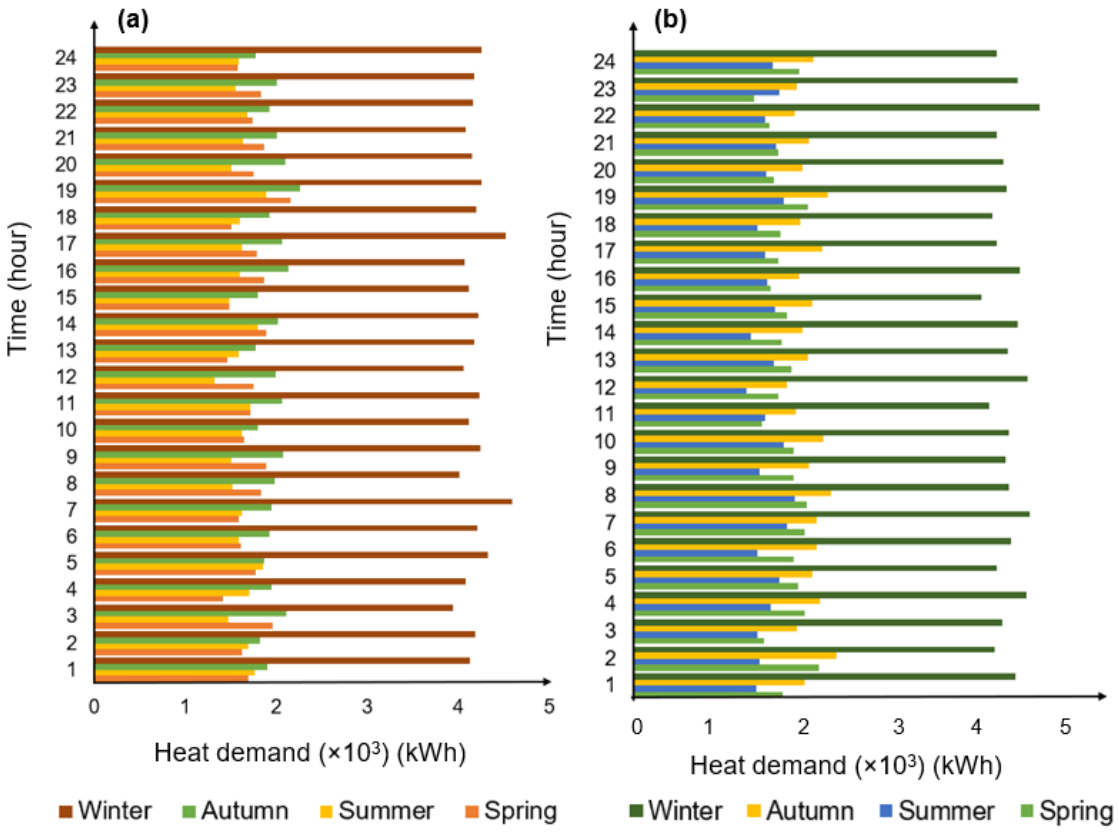

Figure S2. Heat demand and peaks in the first and second years: (a) first year and (b) second year.

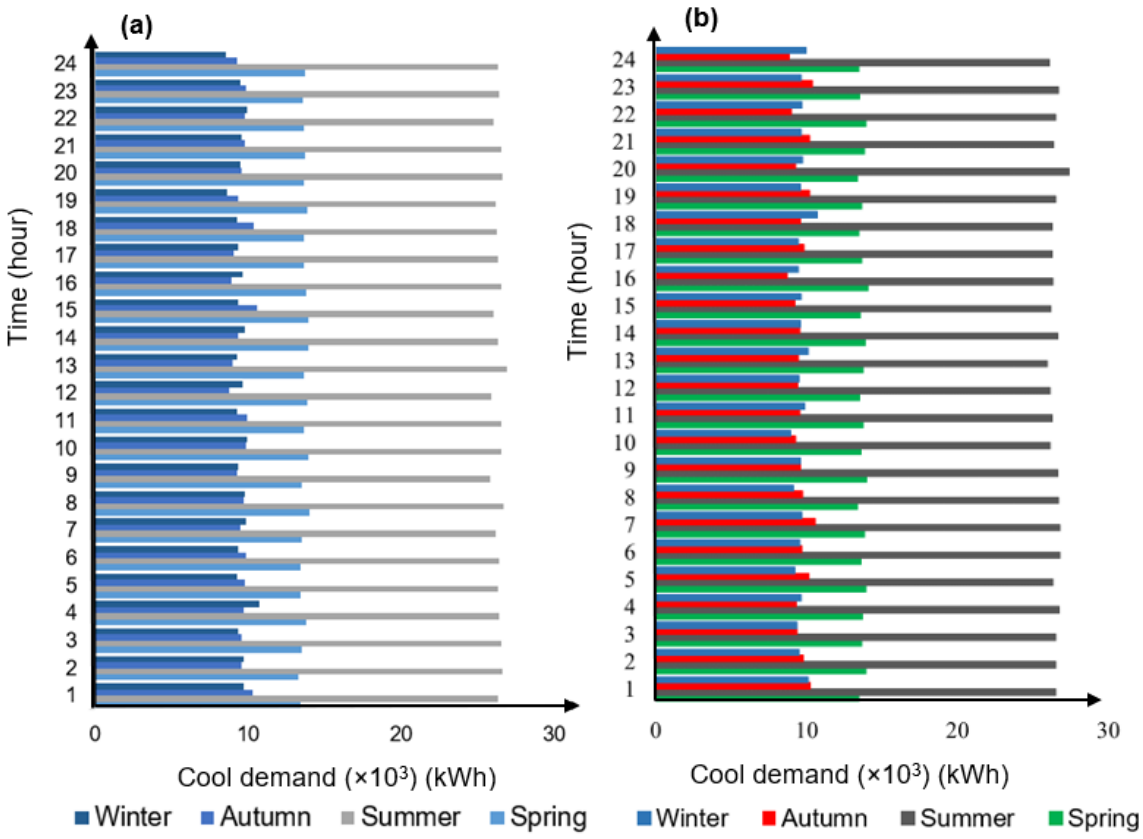

Figure S3. Cool demand and peaks in the first and second years: (a) first year and (b) second year.

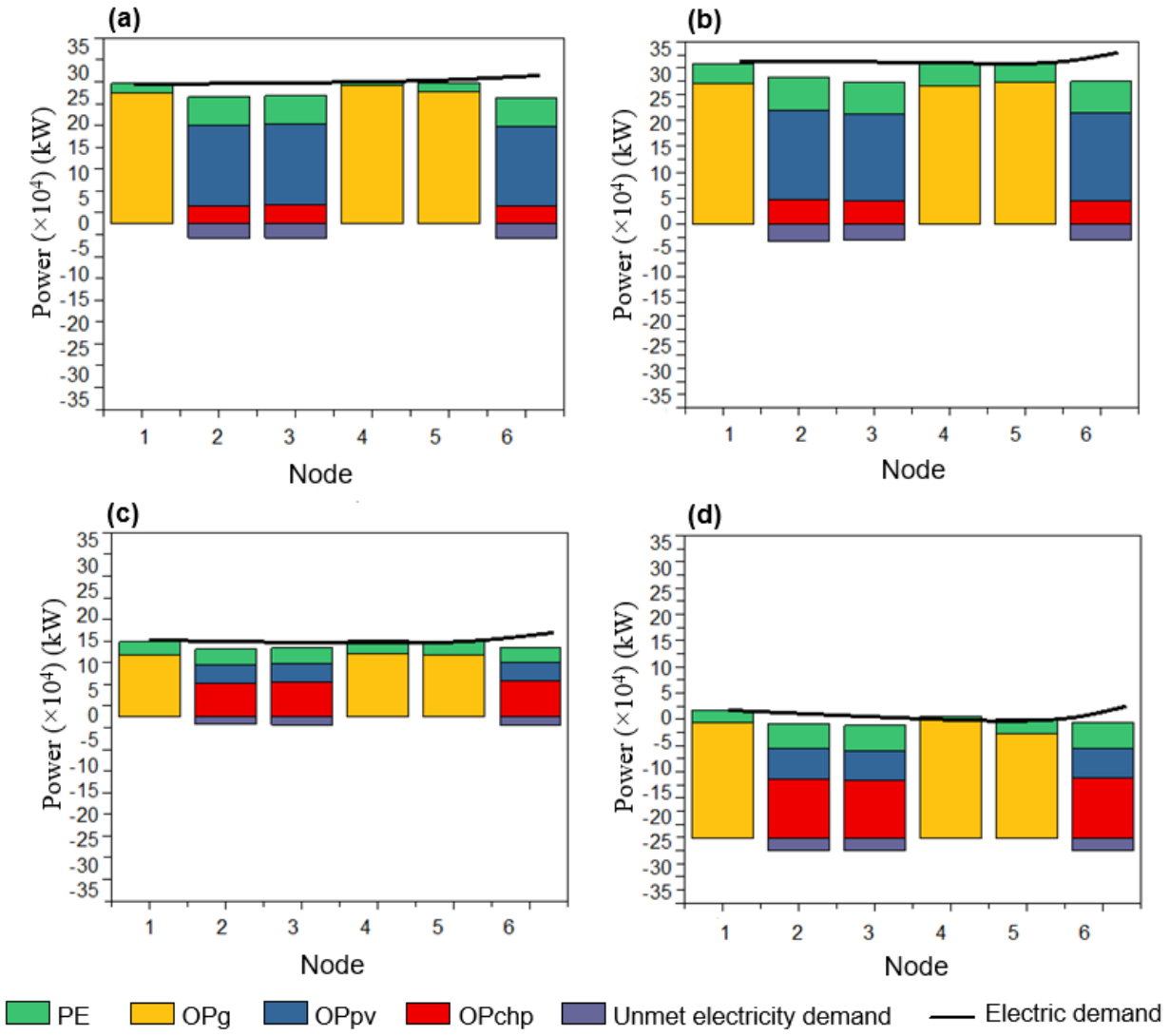

Figure S4. The amount of electricity production, demand, and shortages in the second year: (a) spring season, (b) summer season, (c) autumn season, and (d) winter season.

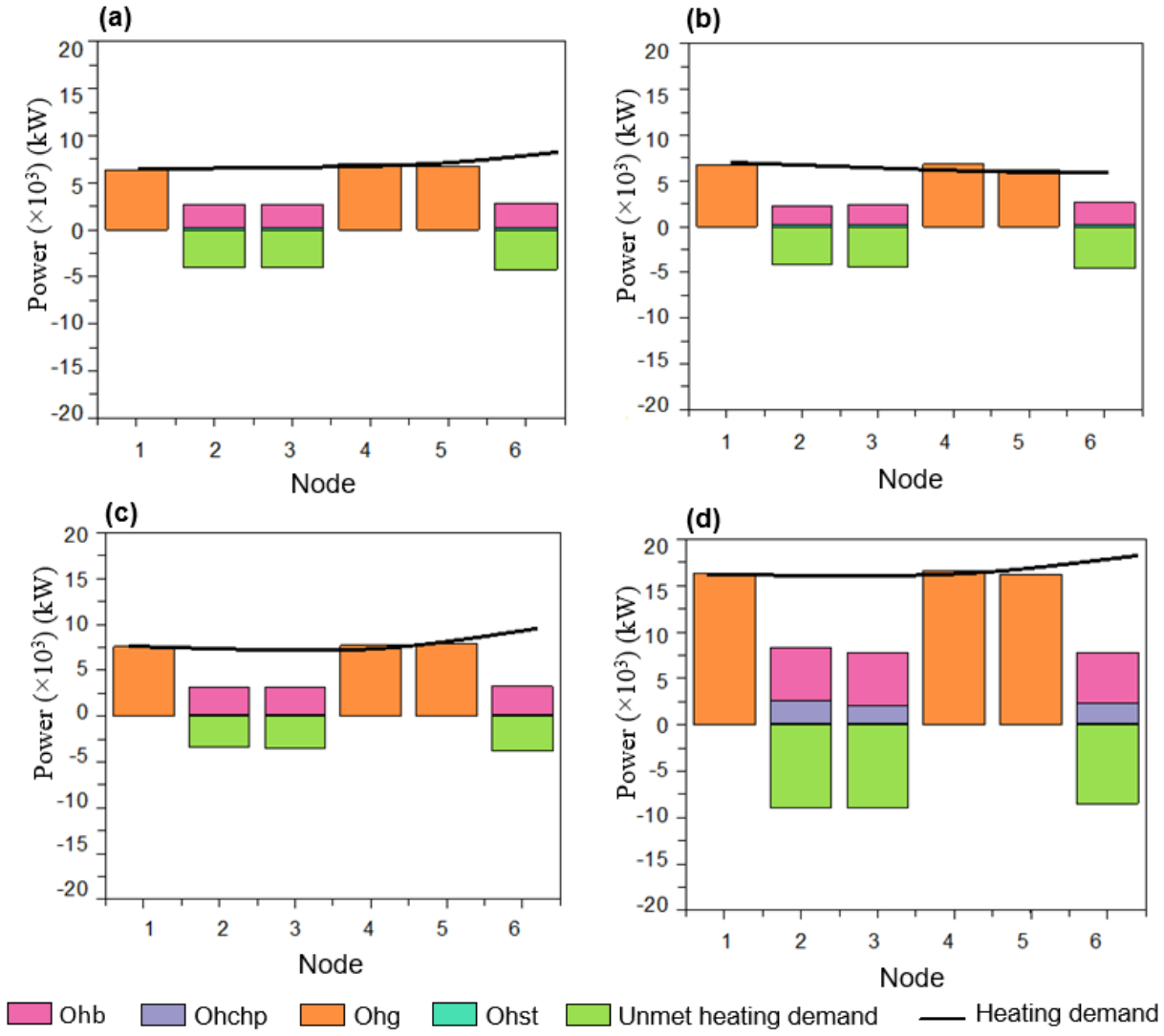

Figure S5. The amount of heat production, demand, and shortage in the second year: (a) spring season, (b) summer season, (c) autumn season, and (d) winter season.

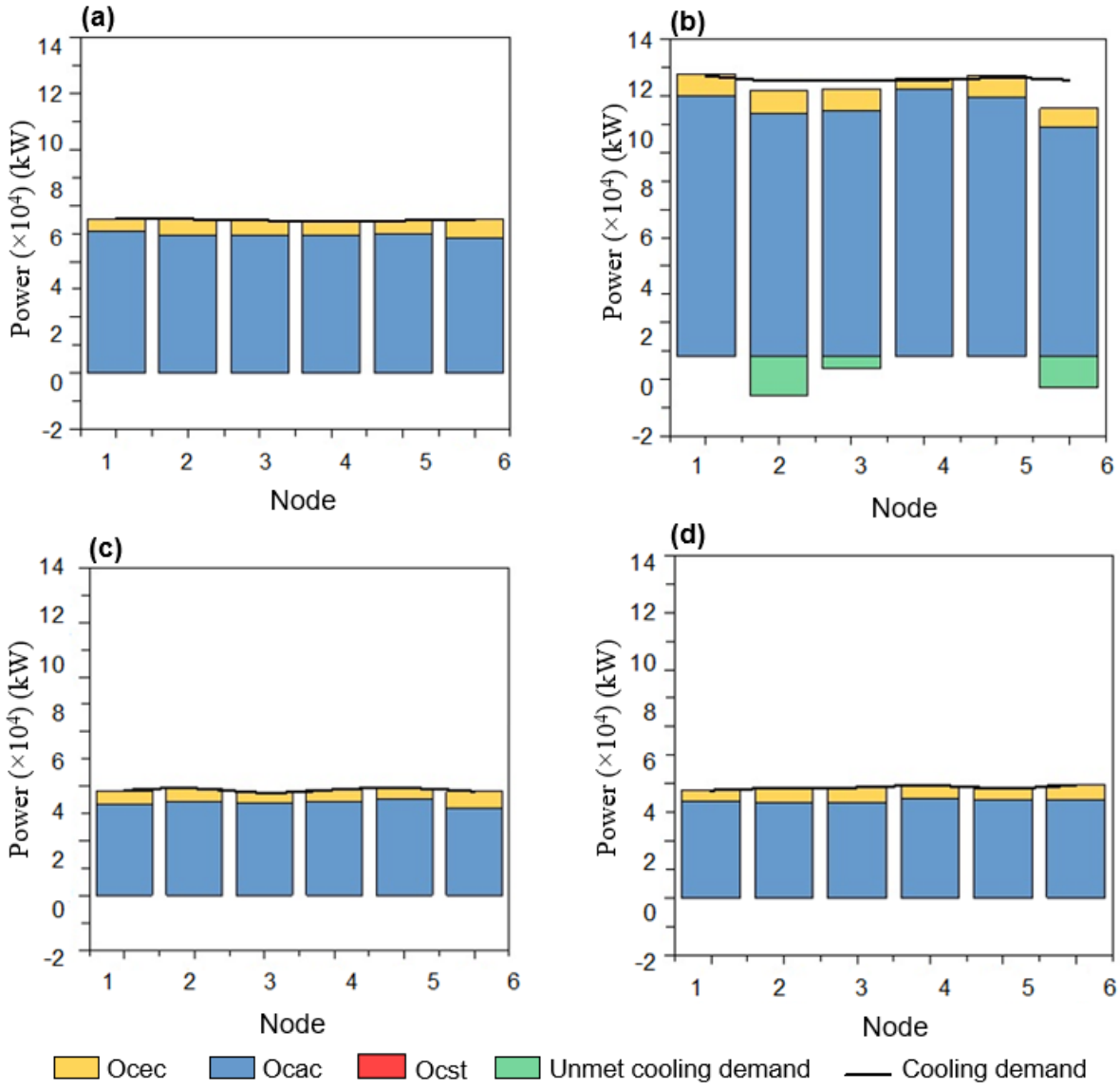

Figure S6. The amount of cool production, demand, and shortage in the second year: (a) spring season, (b) summer season, (c) autumn season, and (d) winter season.

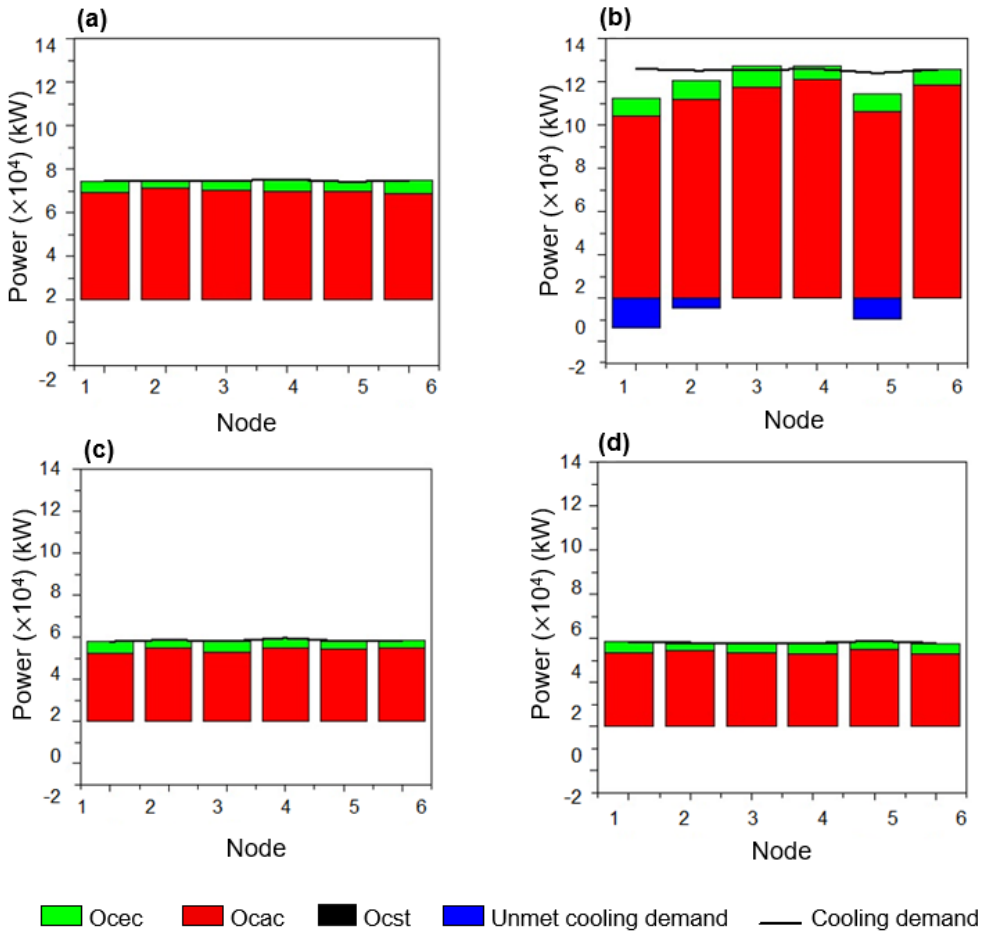

Figure S7. The amount of cool production, demand, and shortage in the first year (a) spring season, (b) summer season, (c) autumn season, and (d) winter season.

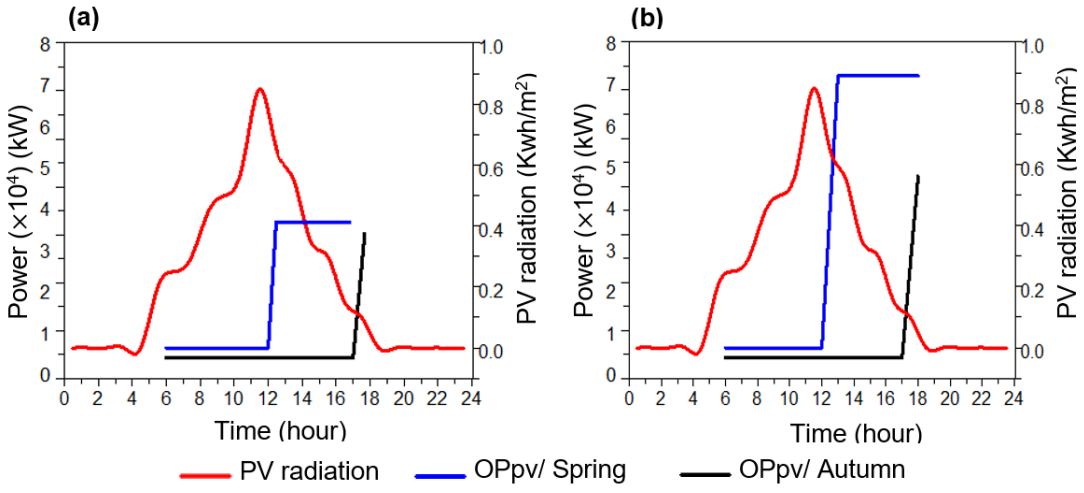

Figure S8. PV radiation and production in the first and second years (a) first year and (b) second year.