

Tab. A1 Parameters of energy hub equipment

| $\eta_{\text{CHP,ele}}$ | $\eta_{\text{CHP,th}}$ | η_{GF} | $\eta_{\text{GSHP}}^{\text{COP}}$ | η_{Trans} | |
|---------------------------|------------------------------|----------------------|-----------------------------------|------------------------------|----------------------|
| 0.3 | 0.4 | 0.9 | 4.5 | 0.98 | |
| $\eta_{\text{es,charge}}$ | $\eta_{\text{es,discharge}}$ | δ_{es} | $\eta_{\text{hs,charge}}$ | $\eta_{\text{hs,discharge}}$ | δ_{hs} |
| 0.96 | 0.96 | 0.01 | 0.98 | 0.98 | 0.02 |

Tab. A2 Renewable energy related parameters

| PV | | | | | |
|----------------------------------|--------------------------|-------------------------------------|-------------------------------------|----------|------------------|
| Total square area/m ² | conversion efficiency /% | Max irradiance /(W/m ²) | Min irradiance /(W/m ²) | α | β |
| 1250 | 14 | 829 | 747 | 2.57 | 1.60 |
| WT | | | | | |
| Rated capacity /kW | Rated wind speed /(m/s) | Cut in wind speed /(m/s) | Cut out wind speed /(m/s) | K | $C/(\text{m/s})$ |
| 200 | 15.0 | 2.0 | 24.0 | 2.3 | 6.0 |

Tab. A3 Electricity purchase/sell price

| Time interval | Electricity purchase price /(RMB/(kW·h)) | Electricity sell price /(RMB/(kW·h)) |
|---------------|--|--------------------------------------|
| 1-7, 23-24 | 0.48 | 0.27 |
| 8-11, 15-18 | 0.88 | 0.88 |
| 12-14, 19-22 | 1.10 | 1.16 |

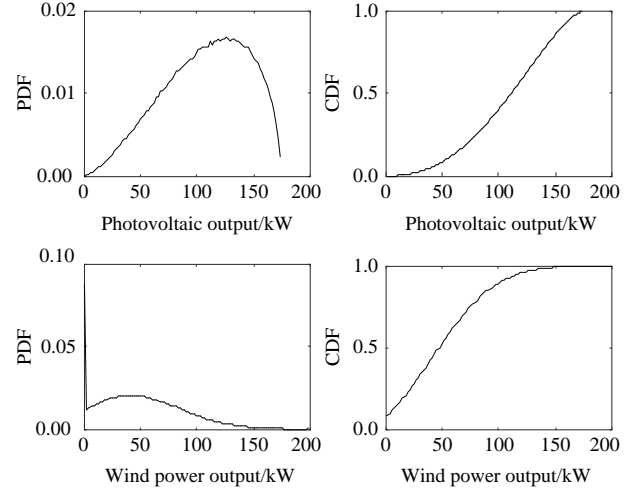
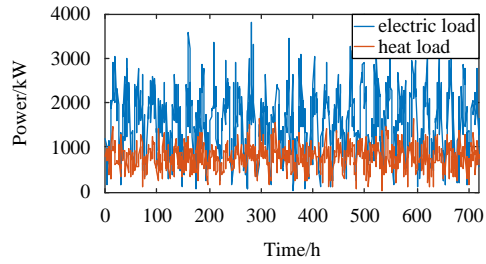
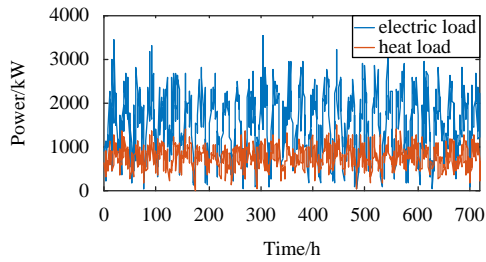


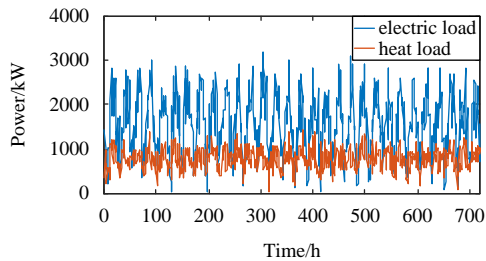
Fig. A2 PDF and CDF curves for renewable energy output



(a) EH1 thermal and electrical load



(b) EH2 thermal and electrical load



(c) EH3 Thermal and electrical load

Fig. A1 Thermal and electrical load curves of different energy hubs