

Extra Data of Case Study for Manuscript: “Energy Management of a Residential Complex Considering its Transactions with DSO and HNO”

Cumulative active power demand of the network for the whole day is depicted in Fig.1:

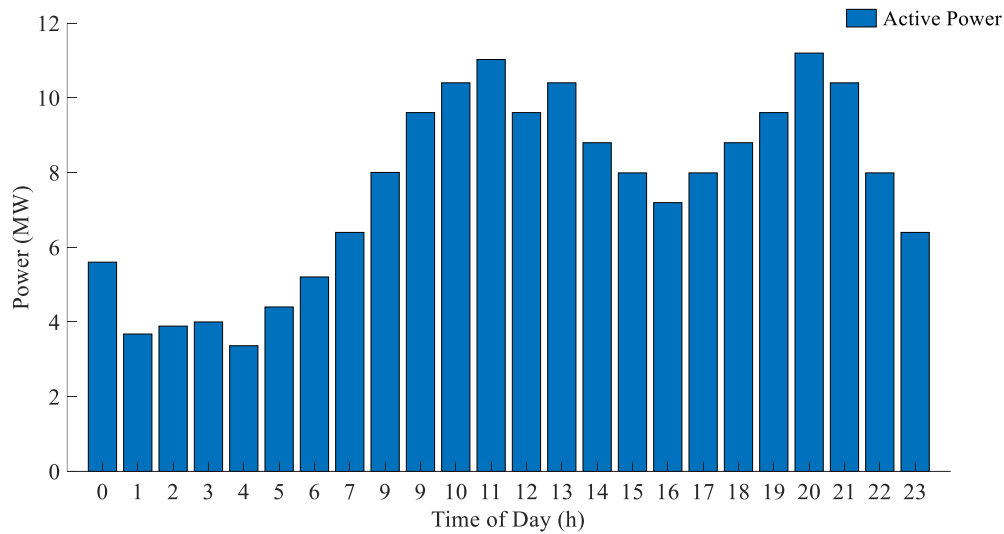


Fig.1 Cumulative active power demand of the 33-bus distribution system

Cumulative heat demand of the network for the whole day is depicted in Fig.2:

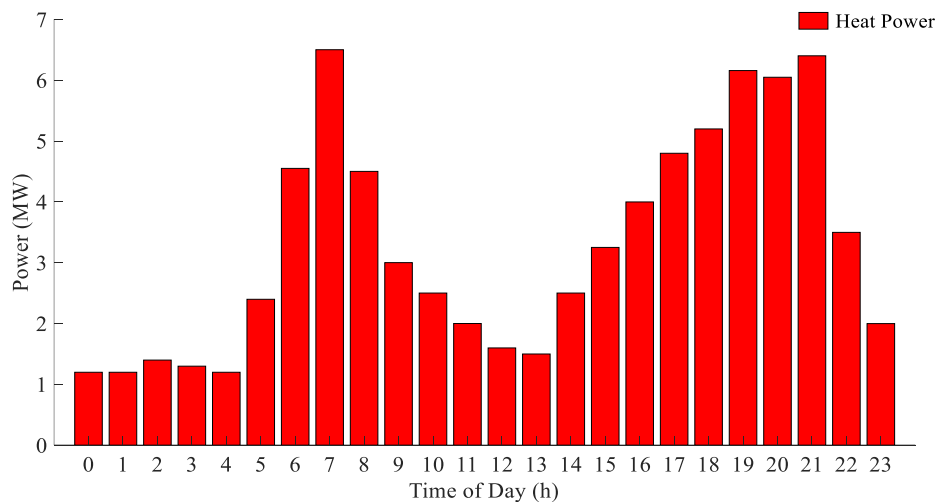


Fig.2 Cumulative heat demand of the 32-node district heating network

Energy hub power demand and heat demand are depicted in Figs. 3, 4, respectively:

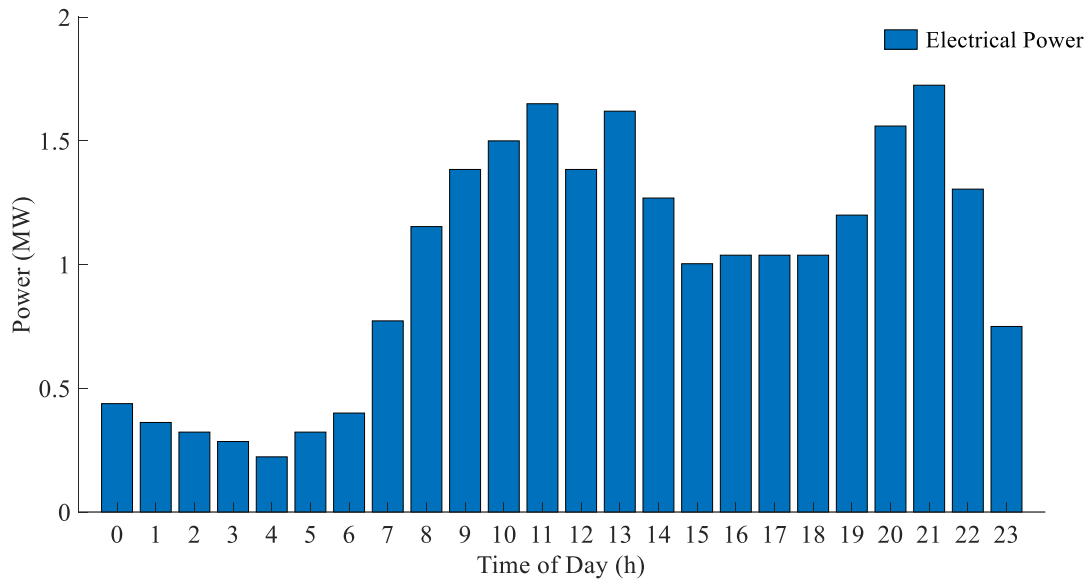


Fig.3 Energy hub electrical power demand

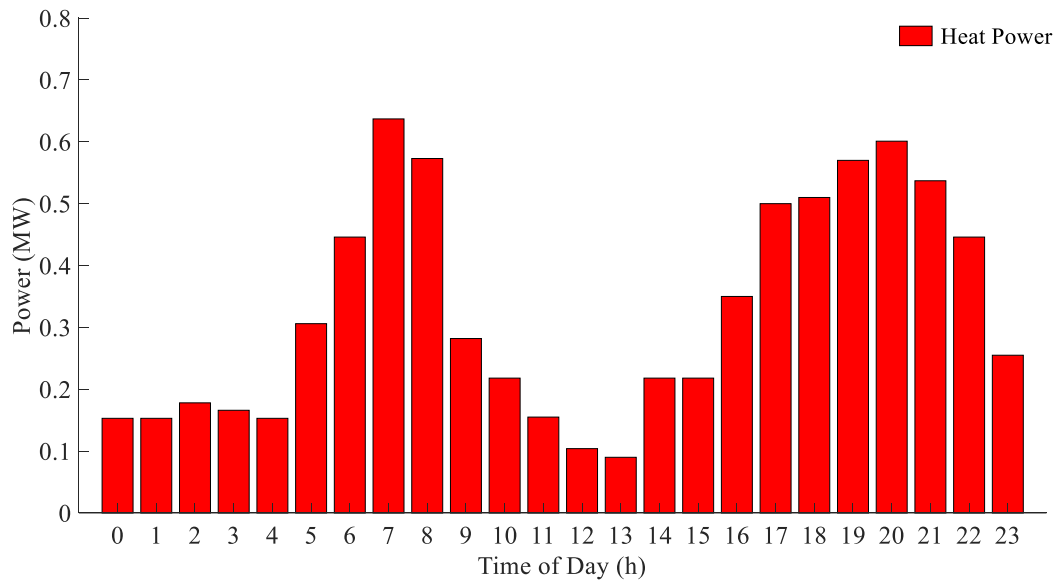


Fig.4 Energy hub heat demand

Electricity price of the upstream grid is depicted in Fig. 5:

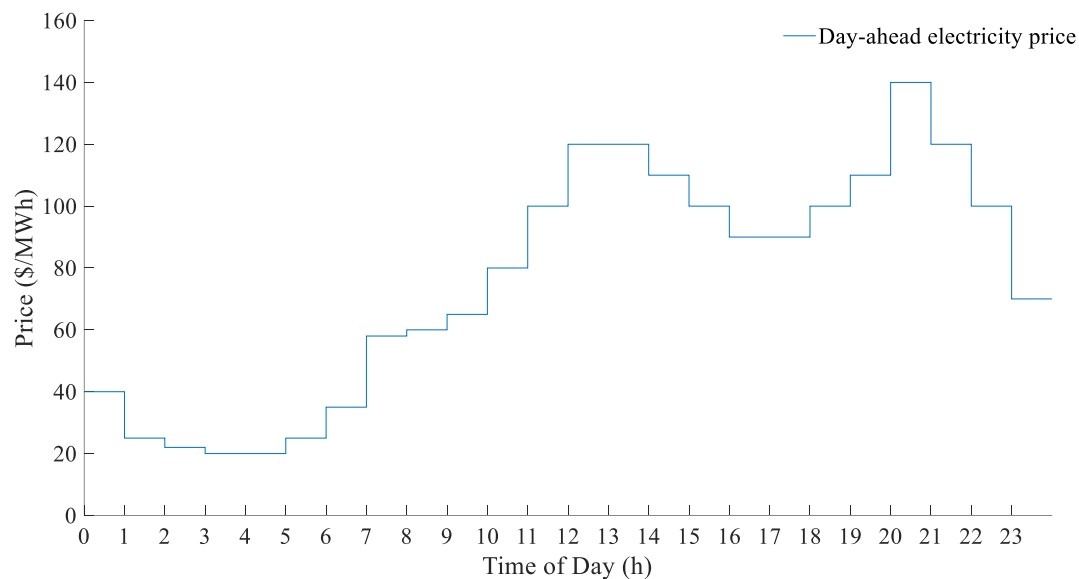


Fig.5 Upstream grid electricity price

The gas turbines (GT) and boilers (GB) parameters are summarized in Table I.

TABLE I
GENERATORS AND GAS BOILERS' PARAMETERS

Installation	Location	P_i^g / h_n^b (MW)	Q_g^i (MVar)	a (\$/MW ²)	b (\$/MW)
GT ₁	Bus 10	[0, 6]	[0,4]	0.14	75
GT ₂	Bus 26	[0, 4]	[0, 2]	0.1	45
GB ₁	Node 1	[0, 3]	-	0.1	32
GB ₂	Node 32	[0, 3]	-	0.4	34

Energy hub installations' parameters and technical limitations are listed in Table II.

TABLE II
EH INSTALLATIONS' PARAMETERS

Variable	Limits	Variable	Limits	Variable	Limits
E_e	[0, 5] MWh	P_h^{dis}	[0, 2] MW	\bar{h}_p	3 MWh
E_h	[0, 5] MWh	η_e^{ch}, η_h^{ch}	0.98	p^{hp}	[0, 1] MW
P_e^{ch}	[0, 3] MW	$\eta_e^{dis}, \eta_h^{dis}$	0.97	h^{hb}	[0,2] MW
P_e^{dis}	[0, 2] MW	\bar{P}_p^{sg}	6 MWh		
P_h^{ch}	[0, 3] MW	\bar{P}_p^{bg}	3 MWh		

The feasible operation region of the CHP unit is depicted in Fig. 6:

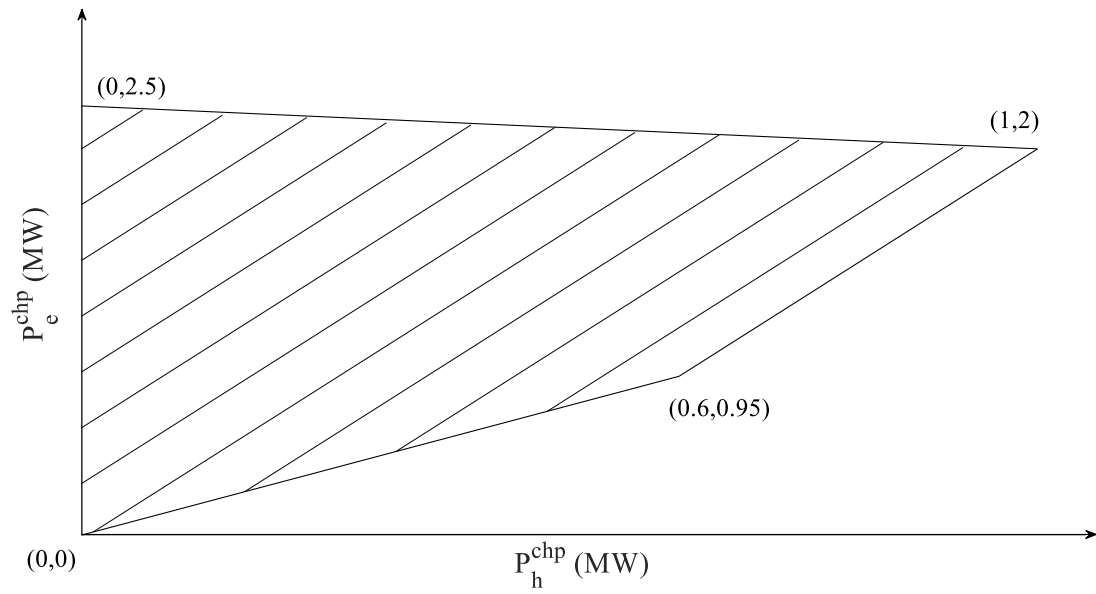


Fig.6 CHP feasible operation region