

# Extra Data of Case Study for Manuscript: “A Complex Residential Energy Hub in Integrated Heat and Electricity Local Markets”

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

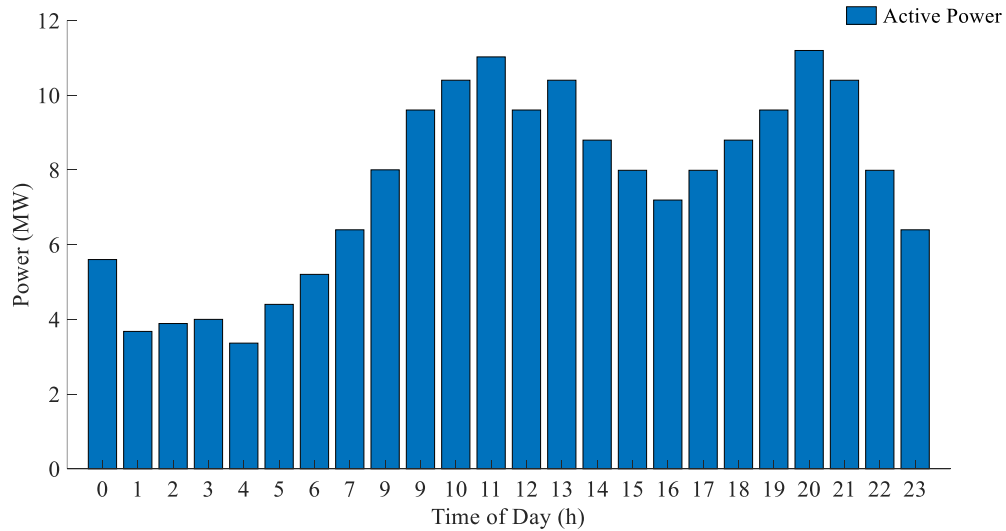


Fig.1 Cumulative active power demand of the 33-bus distribution system

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

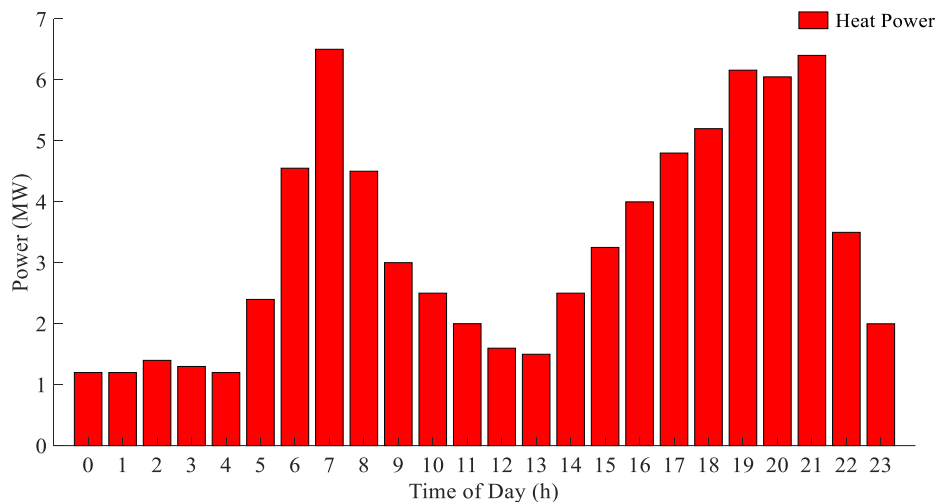


Fig.2 Cumulative heat demand of the 32-node district heating network

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

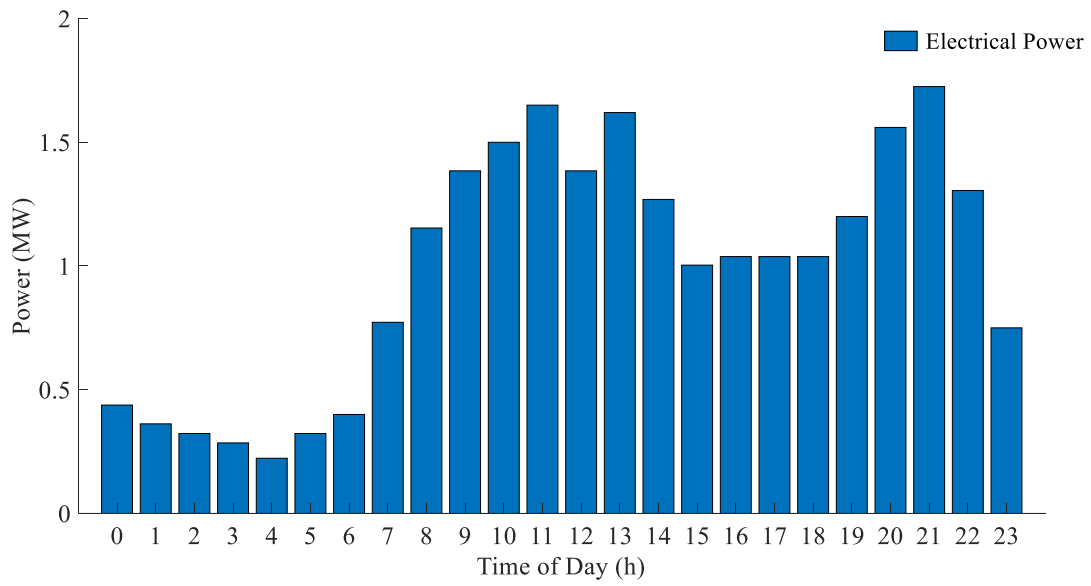


Fig.3 Energy hub electrical power demand

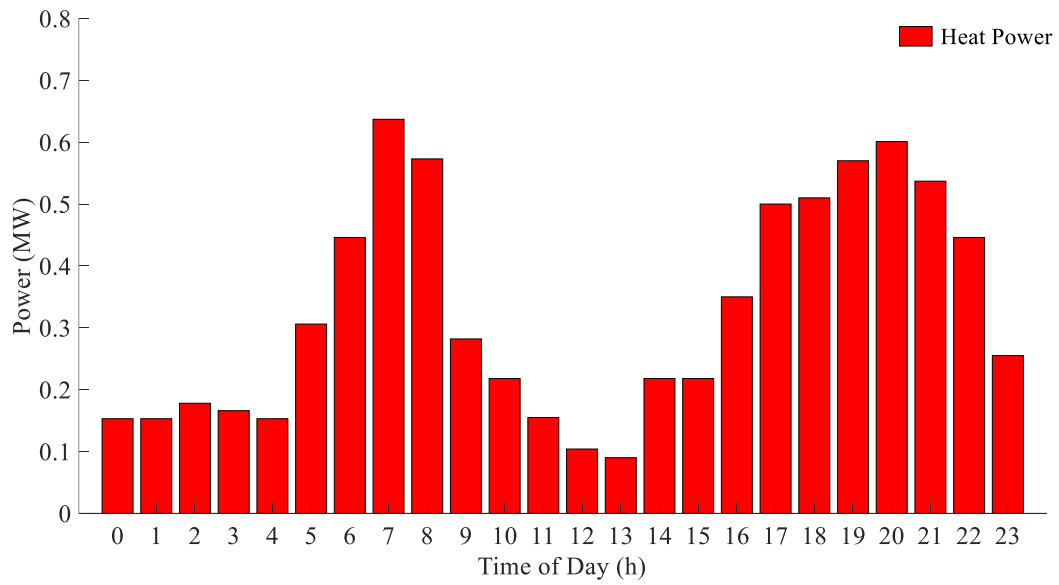


Fig.4 Energy hub heat demand

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

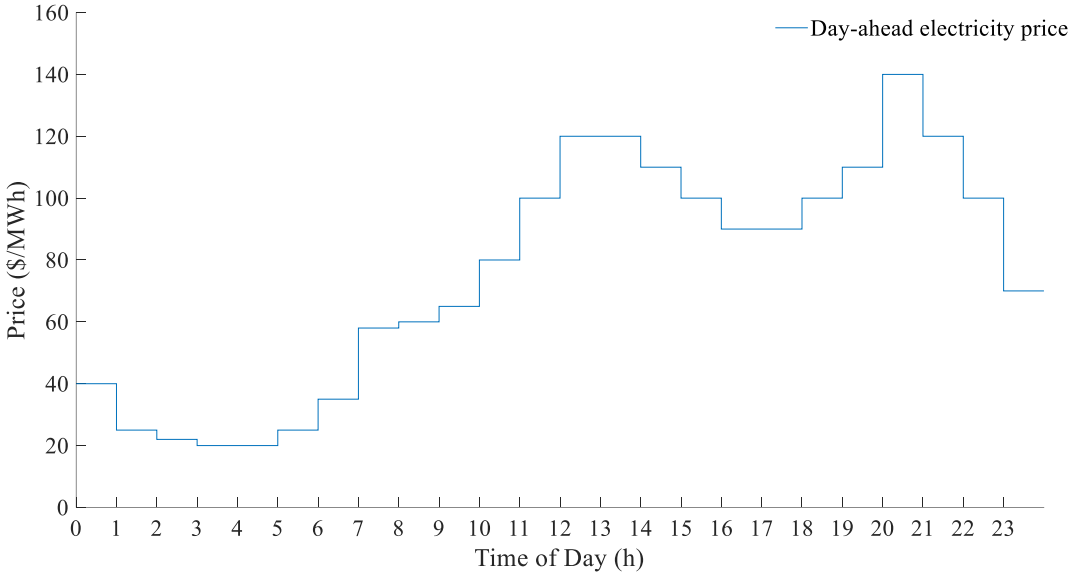


Fig.5 Upstream grid electricity price

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 <sup>2</sup> )	b (\$/MW)
GT <sub>1</sub>	Bus 10	[0, 6]	[0,4]	0.14	75
GT <sub>2</sub>	Bus 26	[0, 4]	[0, 2]	0.1	45
GB <sub>1</sub>	Node 1	[0, 3]	-	0.1	32
GB <sub>2</sub>	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
$E_n$	[0, 5] MWh	$\eta_e^{ch}, \eta_h^{ch}$	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:

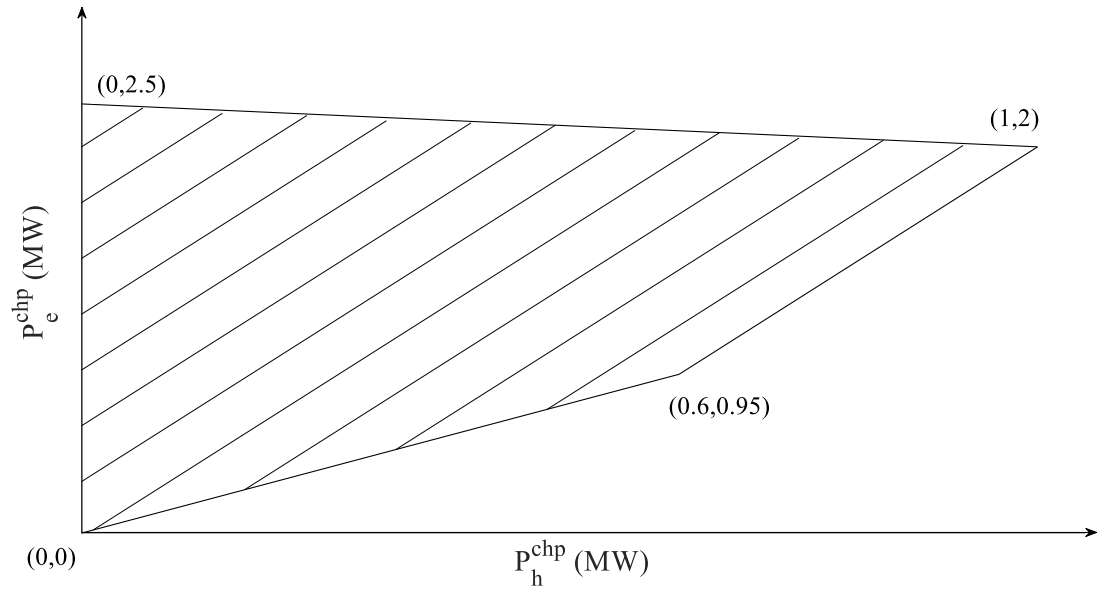


Fig.6 CHP feasible operation region