NOMENCLATURE

E	daily gross energy consumption of natural gas, J	
E_b	base load energy, J	
$E_{CO2,Tot}$	total carbon emissions, kg	
$E_{CO2,G}$	carbon emission level for heating by means of the traditional natural gas-based heating systems, kg	
$E_{CO2,PM}$	carbon emissions from the power market (after switching), kg	
E_h	daily net amount of natural gas required for winter heating, J	
EL	heat pump electrical energy needs, J	
EL_n	new value of electricity demand per hour, J	
HHV, H_H	natural gas High Heating Value, J. kg$^{-1\circ}$C^{-1}	
HP	heat-pump	

LHV, H_L	Low Heating Value, J. kg$^{-1\circ}$C^{-1}	
Q_h	net thermal energy needs to heat the building [J]	
T_{amb}	ambient (internal) temperature, °C	
T_{cond}	heat-pump condenser temperature, °C	
T_{ev}	heat-pump evaporator temperature, °C	
T_{ext}	external (environmental) temperature, °C	
$T_{ext,h}$	external environmental temperature for the hour "h", °C	
SR	switching rate of heating systems from gas to electricity, %	
UE	unserved energy, J	

Greek symbols

η_{ex}	"second law" efficiency	
Δ	difference	