Supplementary material

Table S1: The quality indicators of the typical periods using the mean typical year data

No. periods	N_k=5	N_k^*=7	N_k=9	N_k=11	N_k=13	13 empirical periods
No.time steps	24	34	44	54	64	312 (13 ×24)
σ_{cdc}	0.102	0.050	0.037	0.027	0.026	0.071
$\sigma_{profile}$	0.064	0.056	0.054	0.052	0.052	0.059
ELDC	0.078	0.052	0.047	0.042	0.041	0.056
Δ_{LDC}	0	0	0	0	0	0
$\Delta_{prod,0.07}$	169	63	22	3	1	113

Table S2: Comparison between the qualities of the 13 empirical periods and 7 typical periods using the mean typical year data

No. periods	N_k^*=7	13 empirical periods	Deviation*
No.time steps	34	312 (13 ×24)	
σ_{cdc}	0.050	0.071	30%
$\sigma_{profile}$	0.056	0.059	5%
ELDC	0.052	0.056	7%
Δ_{LDC}	0	0	-
$\Delta_{prod,0.07}$	63	113	44%

* The relative differences between the empirical periods and 7 typical periods.

Table S3: The comparison between the quality of the mean typical year and N_k^*=7 typical periods using the original 20 years data.

Indicators	N_k^*=7	the mean typical year	Deviation*
No. time steps	34	8760 (365 ×24)	
σ_{cdc}	0.063	0.157	60%
$\sigma_{profile}$	0.108	0.102	-6%
ELDC	0.092	0.141	35%
Δ_{LDC}	0	0.282	-
$\Delta_{prod,0.07}$	2128	4582	54%

* The relative differences between the mean typical year and 7 typical periods.

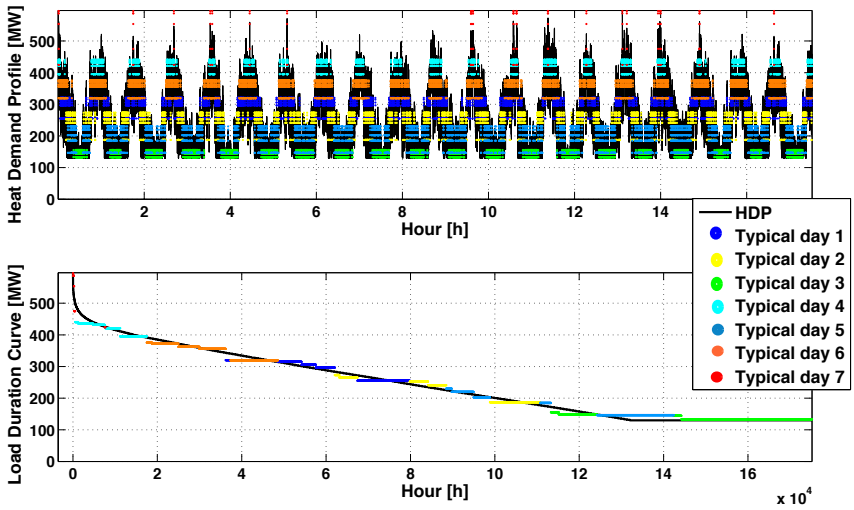

Figure S1: 20 years heat demand profile with 7 typical periods and corresponding 34 total time steps.

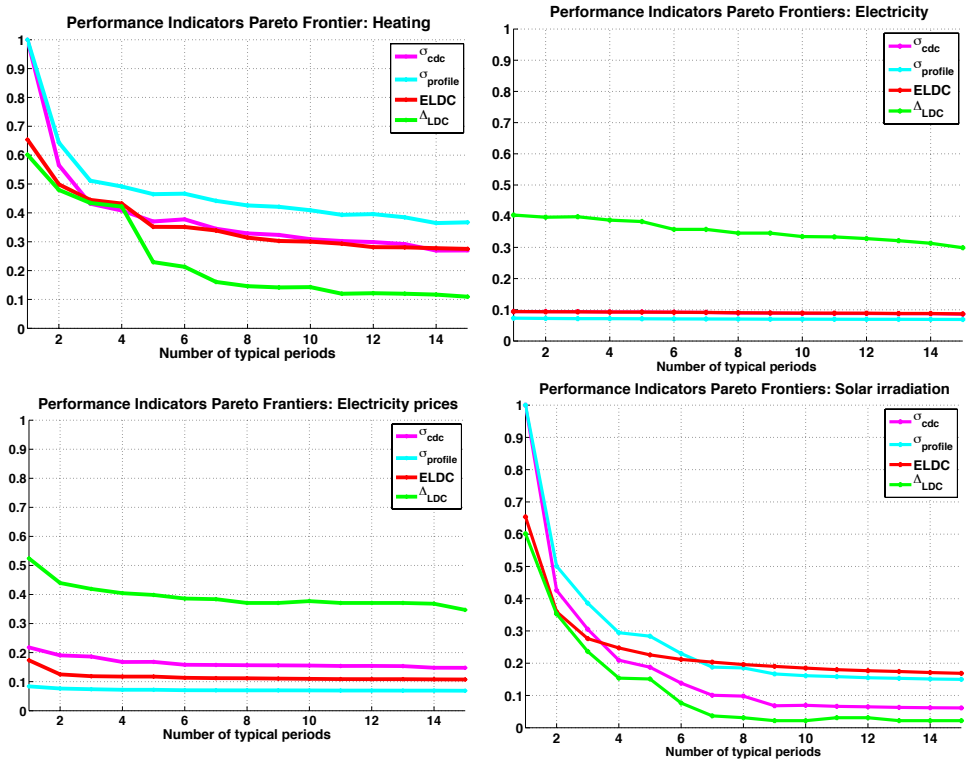

Figure S2: Test case 2 - Pareto frontiers of performance indicators for each type of attributes

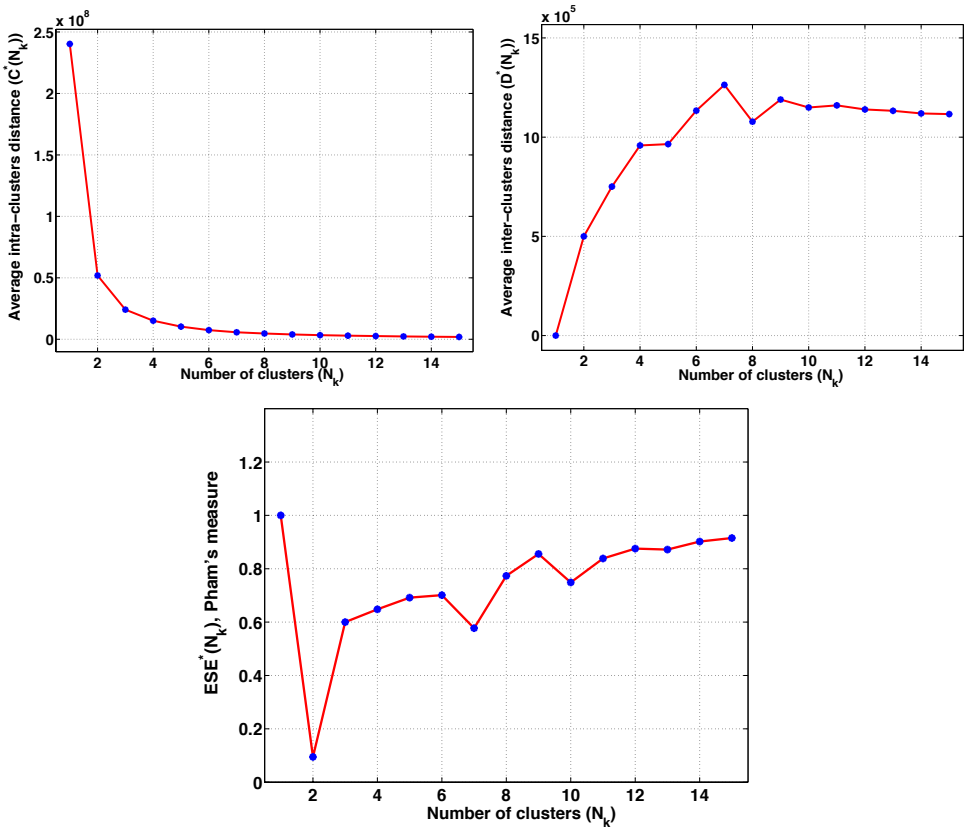

Figure S3: Test case 2 - Intra and inter cluster distances and ESE measures as function of the number of the typical periods