

Block Building Refurbishment With Solar Collectors And Solar Potential Analysis

InStep project Workshop

Bratislava, 10.09.2018 – 12.09.2018

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Outline

Objectives

Block buildings

Building typology

Roof layout

Input parameters

Results

Conclusions

Objectives

Commi-block buildings – typology

Determination of **potential roof area**

Provide quantitative results on the **energy demand**, the **energy production** and the **supply system losses** and to carry out a comparative analysis for the different building types

Calculation of the **system efficiency** and the **solar fraction** of the solar system's in each case

Block buildings – Hungary

Building period: 1966-1992








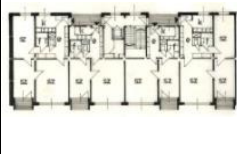
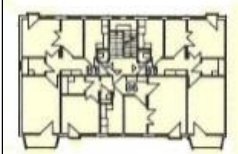

Total number of flats: 510.000

Inhabitants: 13.8% of the population






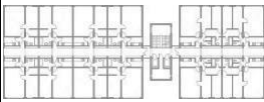
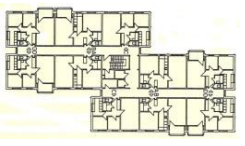
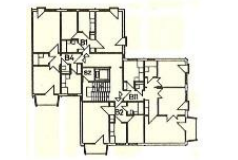

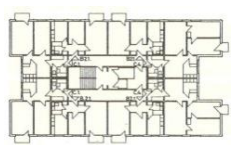


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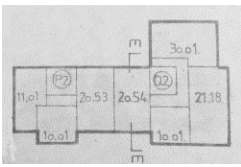
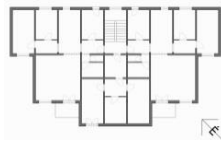
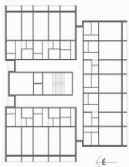
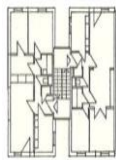
Building typology

Picture					
Layout					
Building code	3FOG - old	3FOG	KY	TB 51	6FOG
Construction period	1960 - 1967	1967 - 1974	1967 - 1974	1974 - 1982	1967 - 1974
Nr. of heated storeys	10	10	11	5	10
Total area of dwellings	8 815,2	17 630,4	9 149,3	3 519,6	14 089,2
Nr. of dwellings	180	360	176	30	300

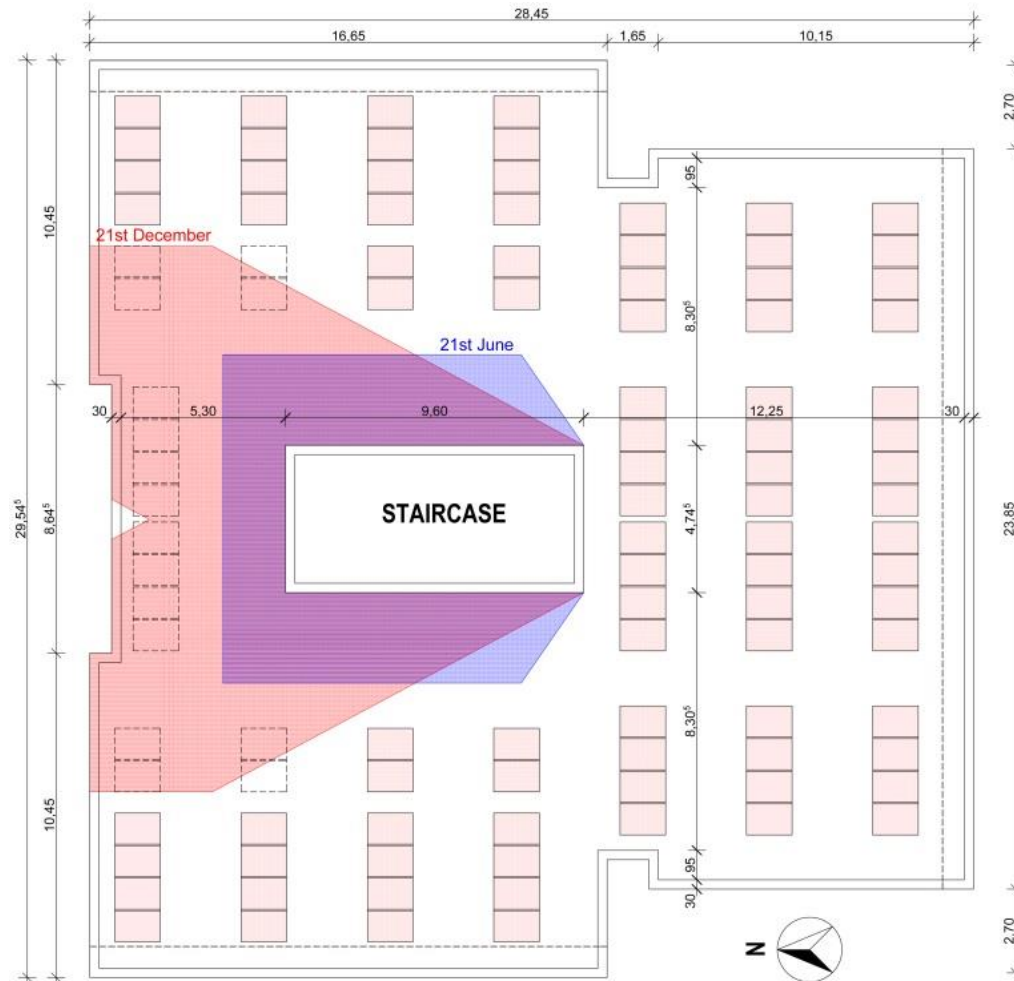
Building typology

Picture					
Layout					
Building code	K-I	A10	KB-512	KF10	C3
Construction period	1974 - 1982	1974 - 1982	1974 - 1982	1974 - 1982	1974 - 1982
Nr. of heated storeys	11	10	10	11	11
Total area of dwellings	6 451,3	4 911,4	3 993,4	3 130,9	4 645,7
Nr. of dwellings	132	100	80	66	88

Building typology

Picture					
Layout					
Building code	GYŐR 6/73	1301	4M	P100	H0
Construction period	1974 - 1982	1982 - 1992	1985	1980	1975
Nr. of heated storeys	5	10	5	15	5
Total area of dwellings	3 049,8	6 729,3	1 068,6	6 824,3	2 024,4
Nr. of dwellings	63	120	14	165	30

Roof layout – P100



Input parameters

Available solar energy: Reindl et. al solar radiation model

Nr. of people – per flat: $n = 2,3$

DHW consumption: $V = 50 \left[\frac{l}{day \cdot person} \right]$

DHW temperature: $\Theta_{DHW} = 50 [^{\circ}C]$

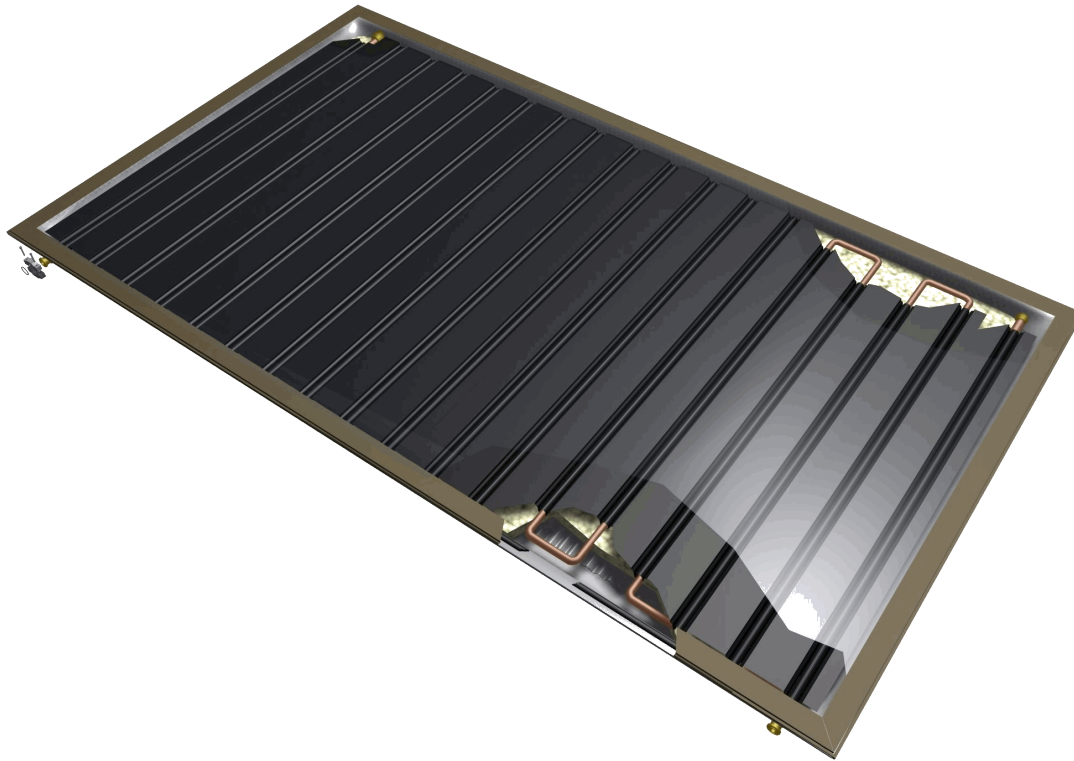
Cold water temperature: $\Theta_{cw} = 11.6 [^{\circ}C]$

Pipe losses ($\Delta\Theta = 30^{\circ}C$): $q_{pipes} = 7 \left[\frac{W}{m} \right]$

Storage losses – per tank: $q_{stor} = 3 \left[\frac{W}{K} \right]$

Solar collector

Thermosolar TS 300

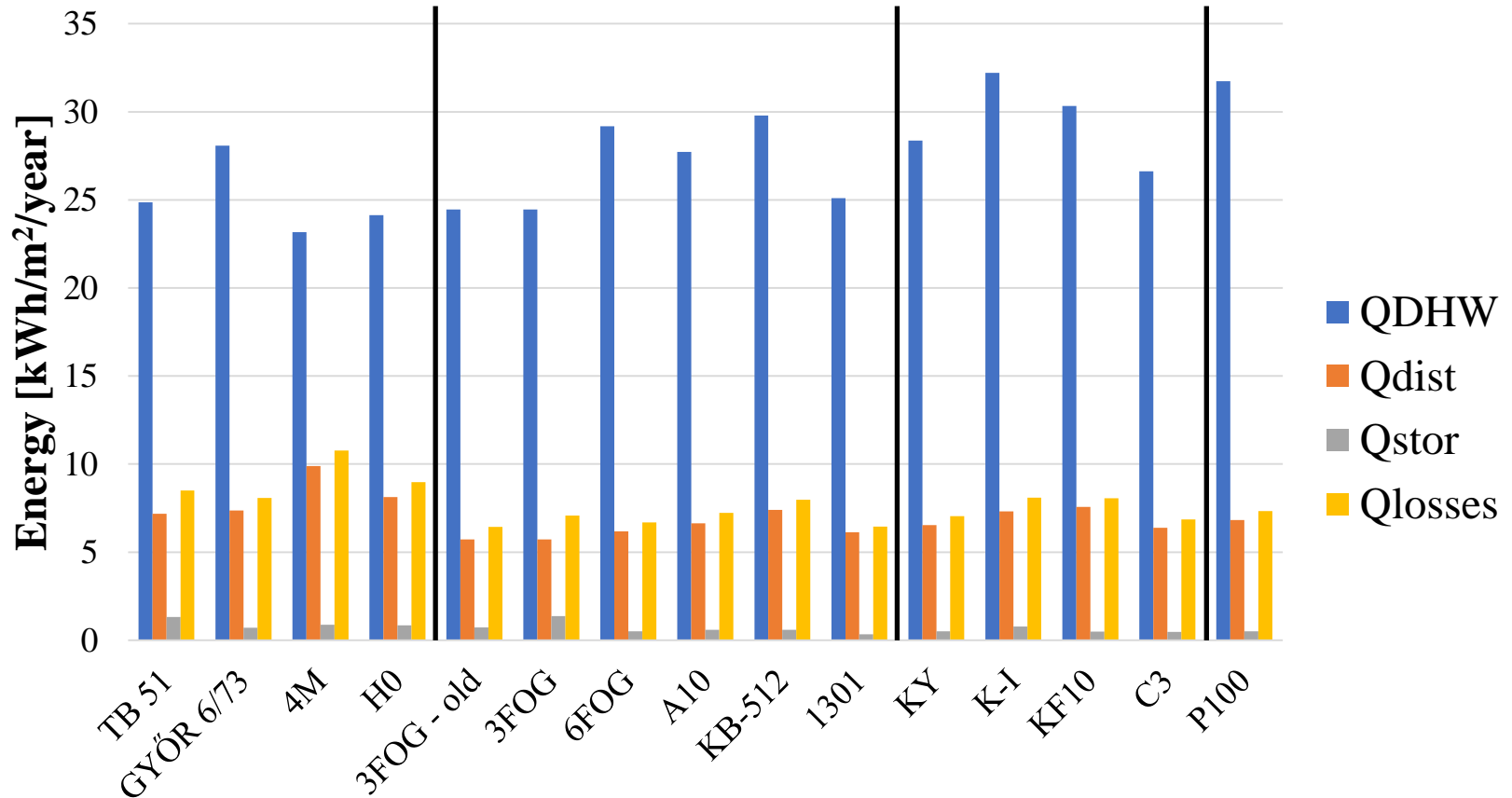


Parameter	Value
η_0	0.8177
k_1	3.65
k_2	0.009
$K_{\text{dir}} (50^\circ)$	0.95

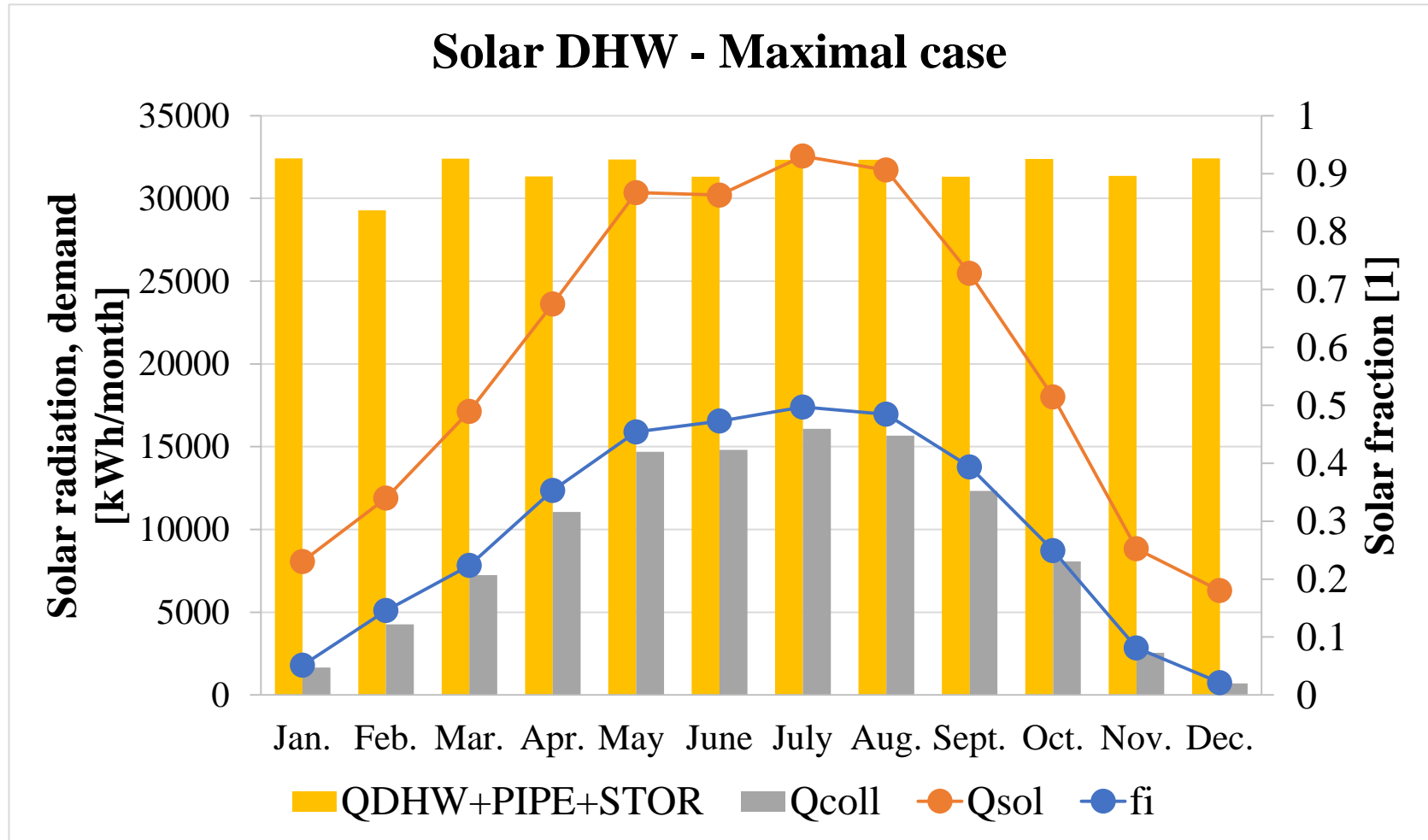
Source: www.naplopo.hu

Results – Energy demand

DHW system demand for each building

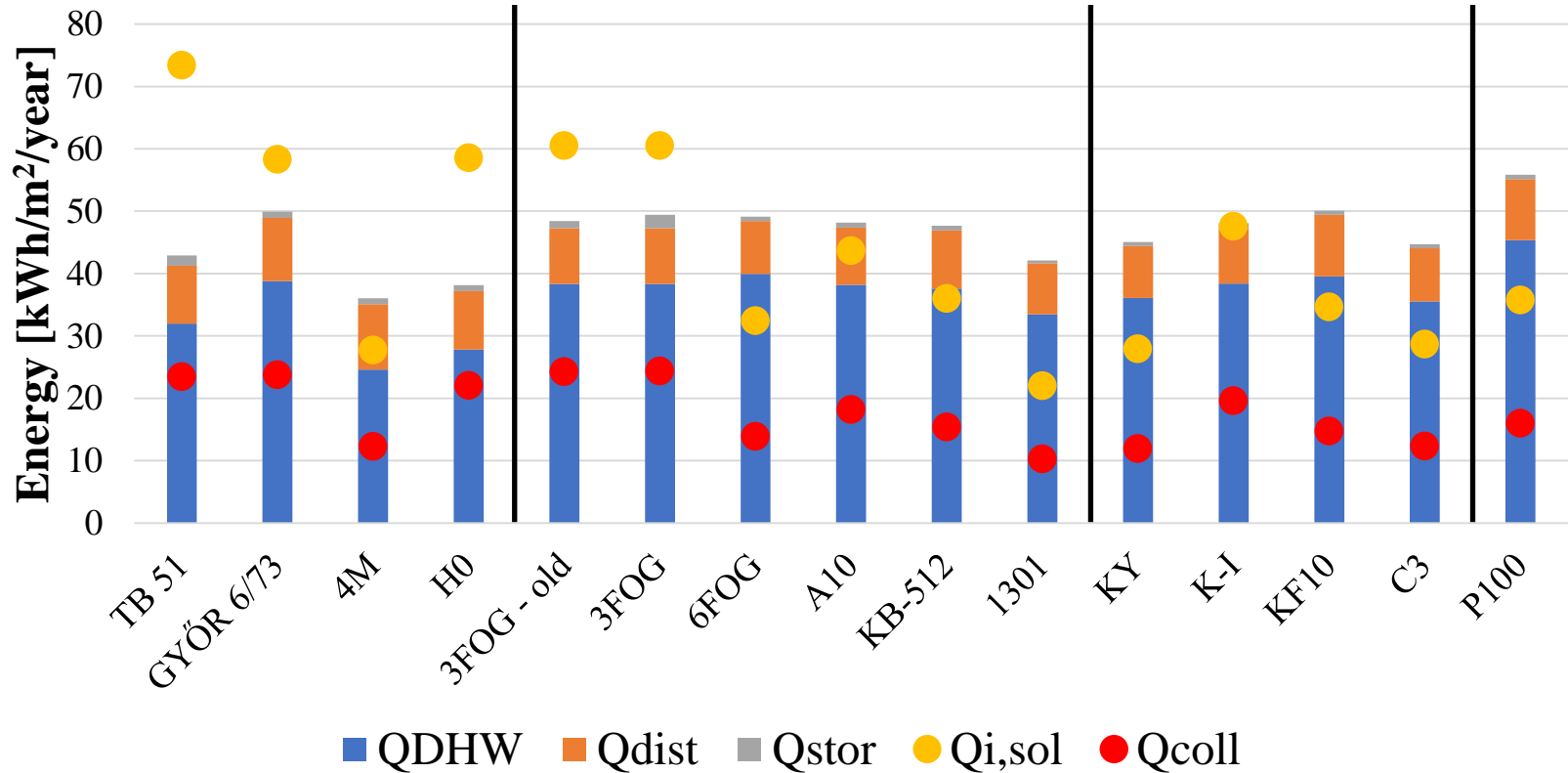


Results – Type P100



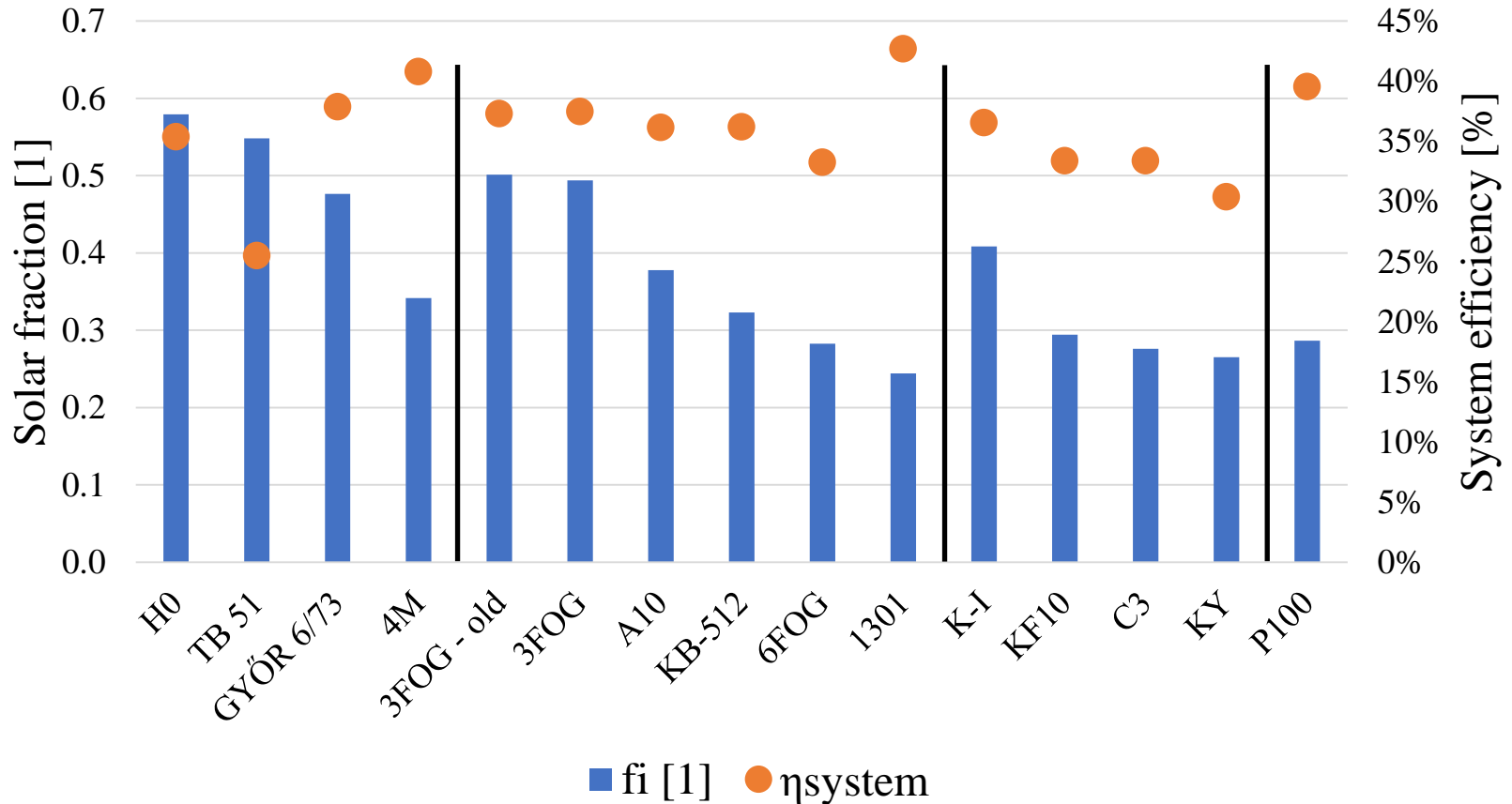
Results

Available solar energy, produced thermal energy and energy demand



Results

Solar fraction and system efficiency



Conclusions

Comparison of the **potential solar energy production**, the **energy demand** and the **energy losses** in 'commi-block' buildings, in order to provide a basis for decision making of investors

Relatively low potential energy collecting surface compared to the high DHW energy demand and the distribution losses

- Average DHW demand is 27.70 kWh/(m²year)
- Distribution and circulation losses are 23.5%
- Storage losses are 2.3%

Average solar fraction is 38%

Average system efficiency is 35.8%

- Visegrad Fund
- •

Thank you for your attention!

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