

Solar systems
Housing co-operative (BD)
in the city of Orlová
Ing. Jan Katauer

SOLÁRNÍ SYSTÉMY

BD v Orlové

Ing. Jan KATAUER

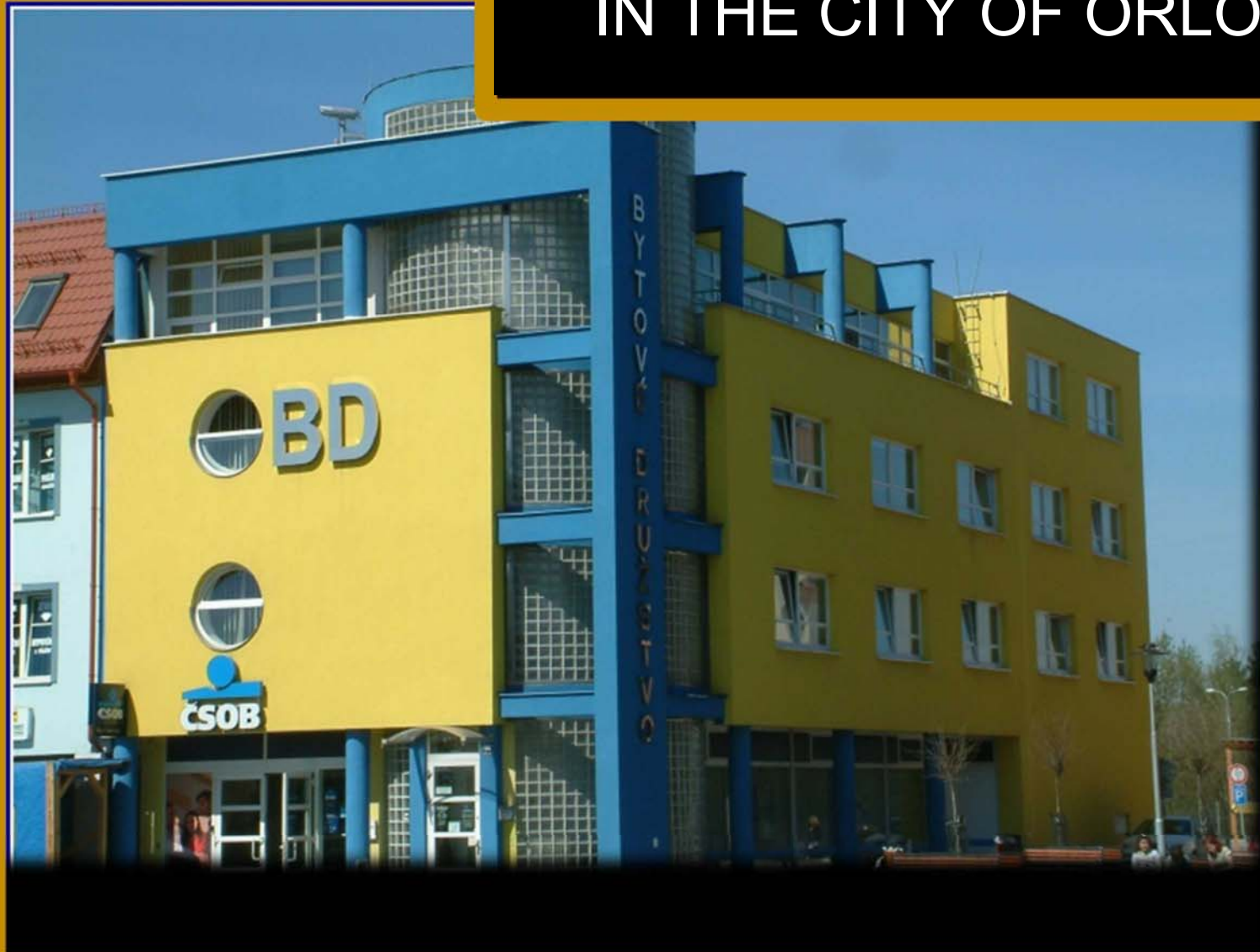
The city of Orlová, 2009

Orlová 2009



10.2.2009

HOUSING CO-OPERATIVE IN THE CITY OF ORLOVÁ



Houses revitalized within the program „Panel“

Year	Number of houses	Number of flats	Cost (mil. CZK)
2001	5	72	14,780
2002	29	694	101,862
2003	27	675	133,442
2004	17	429	100,009
2005	19	523	130,028
2006	21	326	149,705
2007	19	325	115,172
2008	(29)	(602)	147,040
2001 – 2007	137	3044	744,998

Selected economy indices

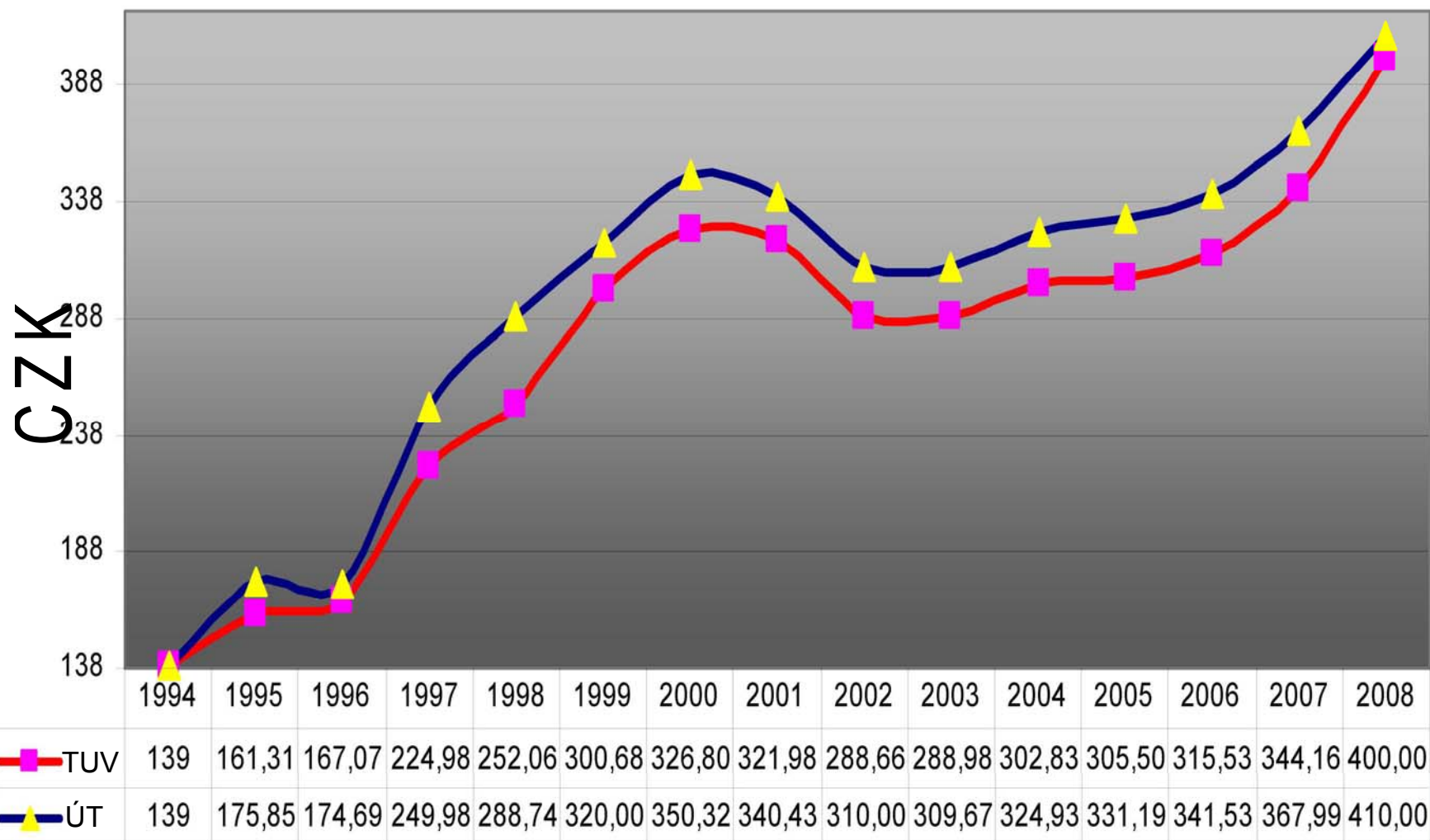
	1996	1998	2000	2002	2004	2006	2007
Yearly rate of rent in CZK	74 896 008	96 766 829	125 065 135	138 269 040	142 428 092	149 413 969	153 060 718
Total yearly repair fund in CZK	17 228 217	25 613 520	39 127 621	52 931 409	64 157 519	71 041 400	75 128 580
Total yearly repair fund in CZK/m2	82	121	186	251	303	335	355
Actual yearly cost of housing repairs in CZK	16 342 821	26 425 322	43 633 357	125 077 162	126 467 479	151 405 000	166 867 994
Included loans in CZK	0	0	0	84 340 020	85 202 461	112 434 000	122 668 664
Number of repaired houses within the program „Panel“				28	17	18	19
Heat consumption in GJ	141 314	100 216	71 054	74 416	64 546	54 428	50 567
Heat price of 1 GJ at the house footing in CZK	178,59	288,74	350,32	310,02	324,93	340,56	354,49
Average yearly consumption in GJ/m2 of the floor area	0,69	0,49	0,35	0,36	0,31	0,27	0,24
Average yearly cost in CZK/m2 of the floor area	123,51	141,61	121,81	112,9	101,82	92	88,62
Total BD yearly cost for TUV heating in CZK	8 432 593	13 461 415	15 944 274	13 040 492	14 192 822	13 813 570	13 973 066
Total BD yearly cost for TUV SV heating in CZK	2 733 749	3 702 624	4 384 616	5 350 000	5 662 140	5 973 095	6 359 328
Total BD yearly cost for TUV in CZK	11 166 342	17 164 039	20 328 890	18 390 492	19 854 962	19 786 665	20 332 394
Total BD yearly heating cost in CZK	25 237 903	28 936 318	24 891 779	23 070 448	20 973 084	18 543 560	17 839 934
Floor area	204 341,60	204 341,60	204 341,60	204 341,60	205 981,57	205 981,57	205 988,99
Recounted area	210 254,51	210 254,51	210 254,51	210 254,51	211 798,37	211 798,37	211 796,84

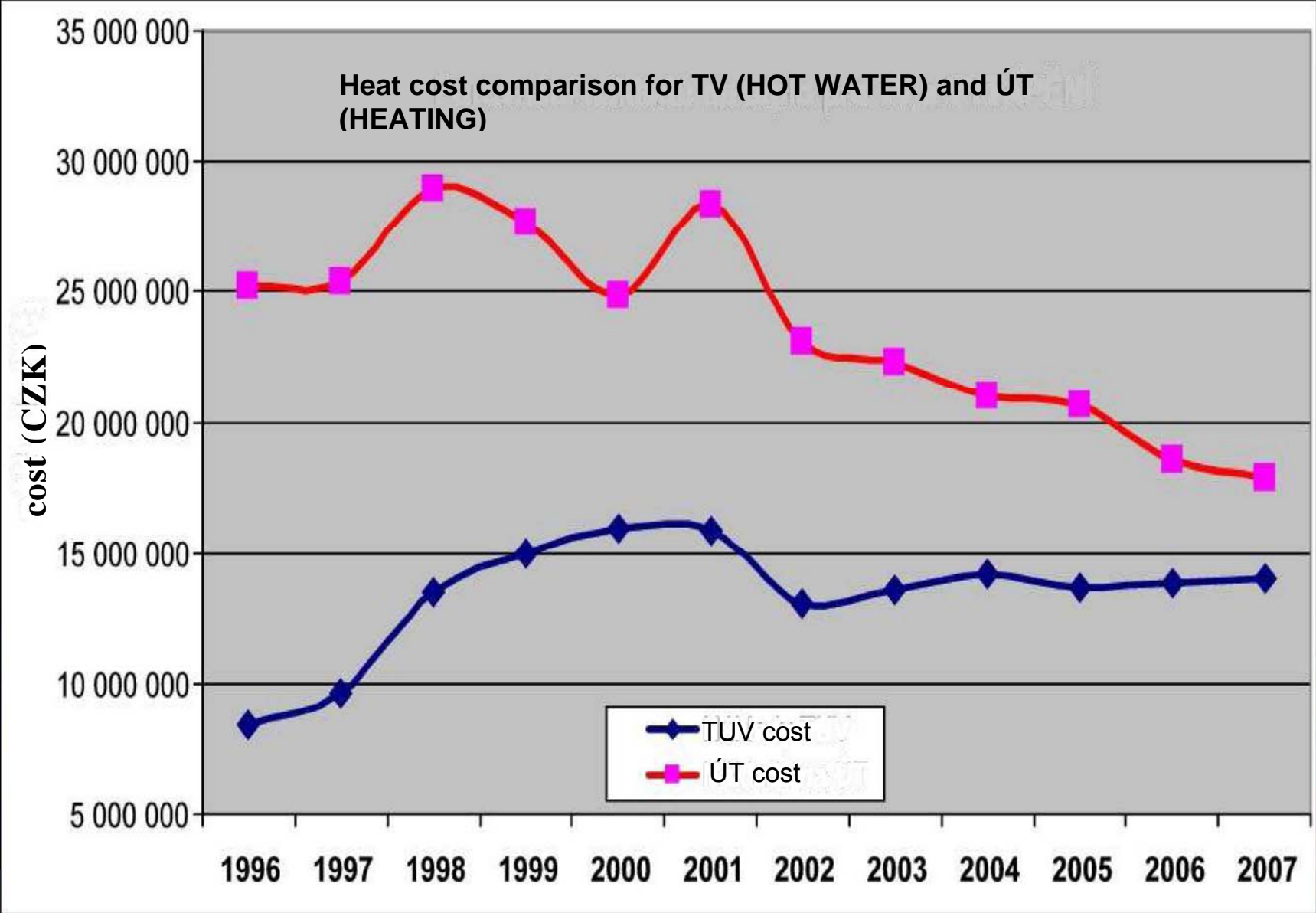
Survey of the solar systems

	Houses connected	Flats	Floor area	OPSS	Set to operation	Number of collectors	Collector area
12	REALIZED	315	18 815,26 m²			248+3 ks	484 m²
6	PLAN 2009	130	8 938,59 m²				
921		24	1 306,39	Additional gas heating	27.5.1999	10	17,60
867		22	1 391,29	Pre-heating SV	1.4.2002	10	17,60
955	954-955-956	72	4 529,00	Pre-heating SV	1.12.2006	45	112,95
699	697-698-699	42	2 243,00	Pre-heating SV	19.10.2007	40	71,00
783	783-784	28	1 483,00	Pre-heating SV	1.2.2008	24	42,00
910		12	684,53	Pre-heating SV	1.8.2008	18	31,70
909		18	1 390,82	Pre-heating SV	1.8.2008	27	47,52
907		12	922,36	Pre-heating SV	1.9.2008	18	31,70
906		12	684,53	Pre-heating SV	1.9.2008	18	31,70
791		23	1 310,03	Pre-heating SV+ÚT	1.11.2008	3 ks vaku.	7.20
864		22	1 387,31	Pre-heating SV	1.11.2008	14	25,00
777	777-778	28	1 483,00	Pre-heating SV	1.11.2008	24	48.48
1250		24	1875,87	Pre-heating SV			
1251		24	1875,87	Pre-heating SV			
771	771-772	28	1483,00	Pre-heating SV			
776		14	751,23	Pre-heating SV			
1024		24	1565,12	Pre-heating SV			
1021		16	1387,50	Pre-heating SV			



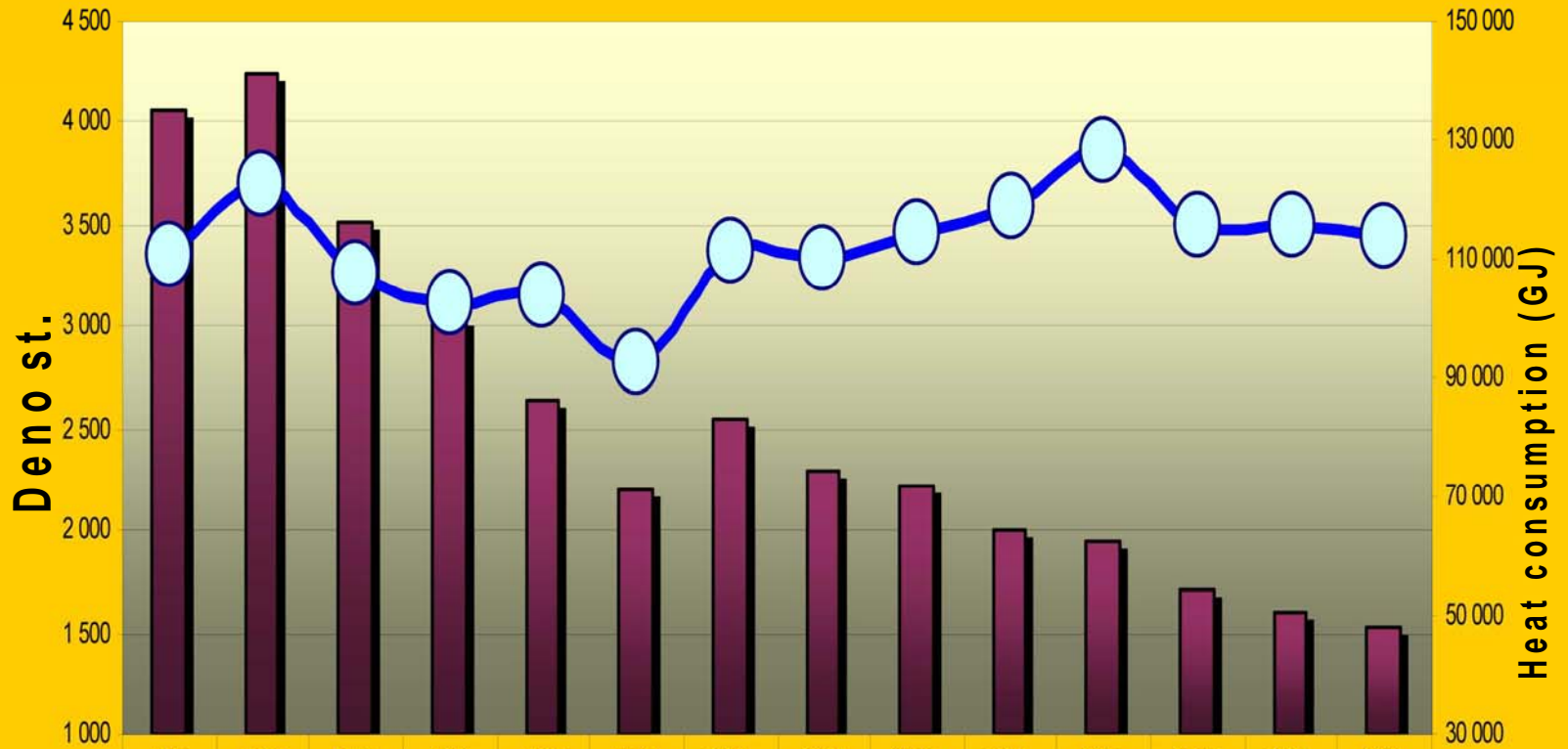
Price growth / heat for ÚT (heating) and TV (hot water)





	čp.	921	867	955	699	784	906	907	909	910	777	791	864
date	sum	Solar gains in single years											
	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)	(GJ)
SUM	1899	374	293	663	248	139	22	27	52	37	18	23	3
MAX		44	46	354	230	135	12	14	27	19	12	23	3
1999	20	20											
2000	37	37											
2001	35	35											
2002	78	40	38										
2003	82	44	37										
2004	79	38	42										
2005	84	40	44										
2006	105	42	46	18									
2007	454	39	44	354	18								
2008	833	38	41	284	230	135	10	13	25	18	12	23	3
2009	91	1	1	7	0	4	12	14	27	19	6	0	0

SURVEY OF YEARLY HEAT CONSUMPTION FOR HEATING



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
HEAT	135 017	141 314	116 221	100 216	86 464	71 054	83 399	74 416	72 086	64 600	62 418	54 457	50 376	48 123
DENO st.	3 347	3 698	3 269	3 121	3 159	2 827	3 372	3 330	3 462	3 594	3 857	3 493	3 496	3 446

Orlová-Lutyně,
Okružní, no. 921

TUV combined production
by solar collectors and gas
heaters.

Number of flats connected : 24

Area of flats connected: 1306 m²

In operation since : 5/1999

Number of collectors : 10 pcs - 17,5 m²



921

18/10/02

Collectors HELIOSTAR 202N2LF 10 pcs i.e. 17,2 m²

10 KS 17,5 m²



921

18/10/02

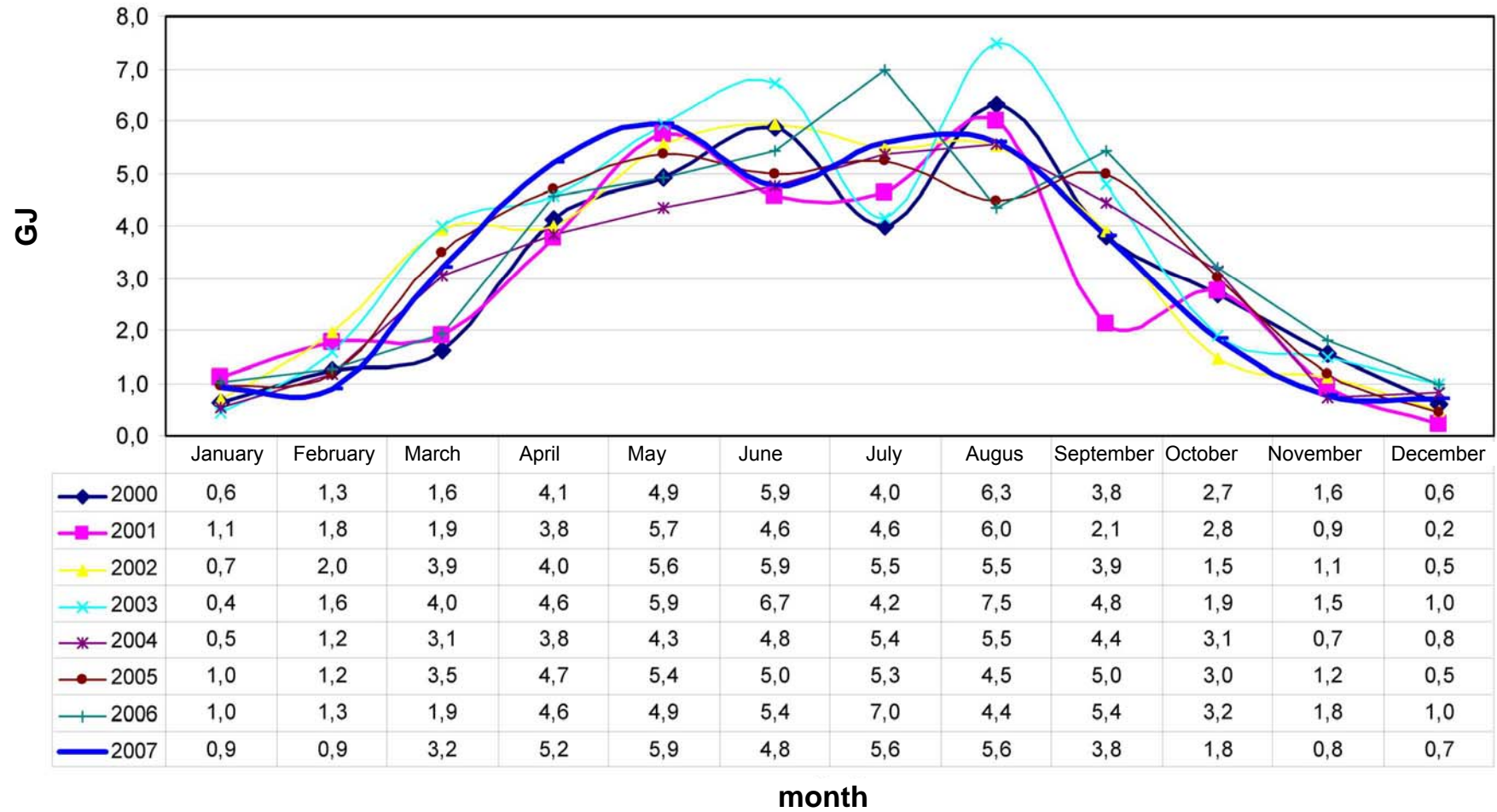
Reservoir ANTIKOR, capacity
2 x 400 litres



2 x Reservoir gas heater
230 l



Gains from the solar system, house no. 921



Yearly gains	37,5	35,6	40,1	44,1	37,8	40,0	41,9	39,2	37,9
Average monthly gains	3,1	3,0	3,3	3,7	3,1	3,3	3,5	3,3	3,1
Max. monthly gains	6,3	6,0	5,9	7,5	5,5	5,4	7,0	5,9	5,5
Min. monthly gains	0,6	0,2	0,5	0,4	0,5	0,5	1,0	0,7	1,0

	Monthly average	Max. monthly	Min. monthly	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
January	0,8	1,1	0,4	0,6	1,1	0,7	0,4	0,5	1,0	1,0	0,9	1,0	
February	1,4	2,0	0,9	1,3	1,8	2,0	1,6	1,2	1,2	1,3	0,9	1,6	
March	2,9	4,0	1,9	1,6	1,9	3,9	4,0	3,1	3,5	1,9	3,2	3,2	
April	4,4	5,2	3,8	4,1	3,8	4,0	4,6	3,8	4,7	4,6	5,2	3,7	
May	5,3	5,9	4,3	4,9	5,7	5,6	5,9	4,3	5,4	4,9	5,9	5,2	
June	5,4	6,7	4,6	5,9	4,6	5,9	6,7	4,8	5,0	5,4	4,8	4,8	
July	5,2	7,0	4,2	4,0	4,6	5,5	4,2	5,4	5,3	7,0	5,6	5,3	
August	5,7	7,5	4,4	6,3	6,0	5,5	7,5	5,5	4,5	4,4	5,6	5,5	
September	4,2	5,4	2,1	3,8	2,1	3,9	4,8	4,4	5,0	5,4	3,8	3,1	
October	2,5	3,2	1,5	2,7	2,8	1,5	1,9	3,1	3,0	3,2	1,8	2,5	
November	1,2	1,8	0,7	1,6	0,9	1,1	1,5	0,7	1,2	1,8	0,8	1,0	
December	0,7	1,0	0,2	0,6	0,2	0,5	1,0	0,8	0,5	1,0	0,7	1,0	

Orlová-Lutyně,
Školní, no.867

Pre-heating of SV for TUV production in OPSS

Number of flats connected: 22

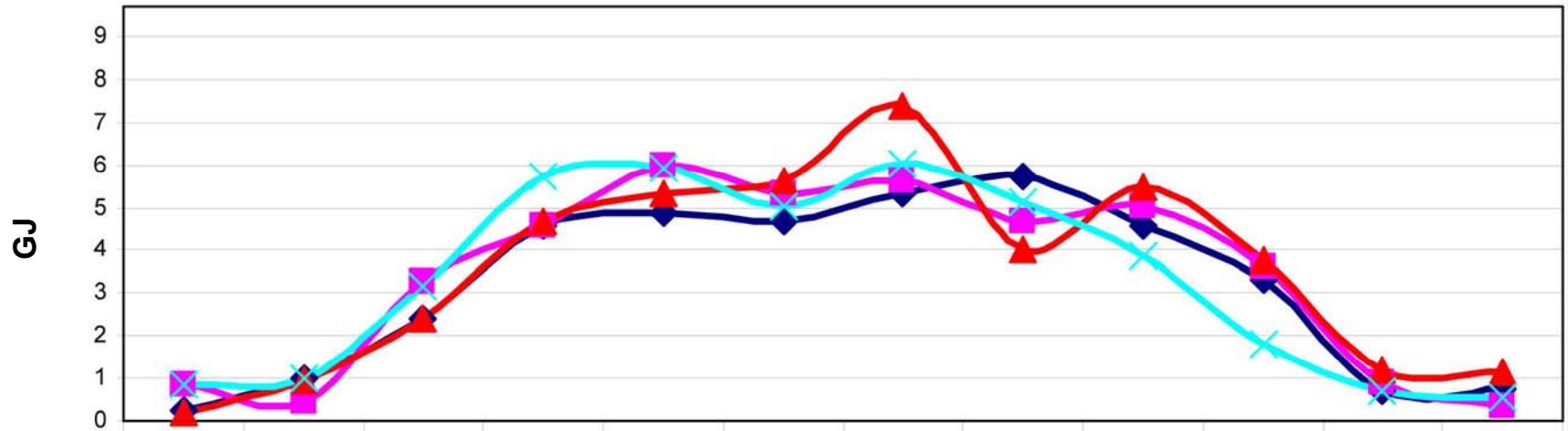
Area of flats connected: 1391 m²

In operation since: 4 / 2002

Number of collectors: 10 pcs - 17,5 m²



SOLAR 867 – amount of the produced energy in GJ



	January	February	March	April	May	June	July	August	September	October	November	December
2004	1	1	3	5	5	5	6	6	5	4	1	1
2005	1	1	4	5	6	6	6	5	5	4	1	1
2006	1	1	3	5	6	6	8	4	6	4	2	1
2007	1	1	3	6	6	5	6	5	4	2	1	1

month



Collectors HELIOSTAR 202N2LF 10 pcs i.e. 17,5 m²



Reservoir ANTIKOR, capacity 2 x 400 litres





10/4/02

Orlová-Lutyně,
Masarykova, nos. 954-956

Pre-heating of SV for TUV production in OPSS

Number of flats connected: 72

Area of flats connected: 4529 m²

In operation since: 12 / 2006

Number of collectors: 45 pcs - 112,95 m²











Accumulative reservoir 6 m3







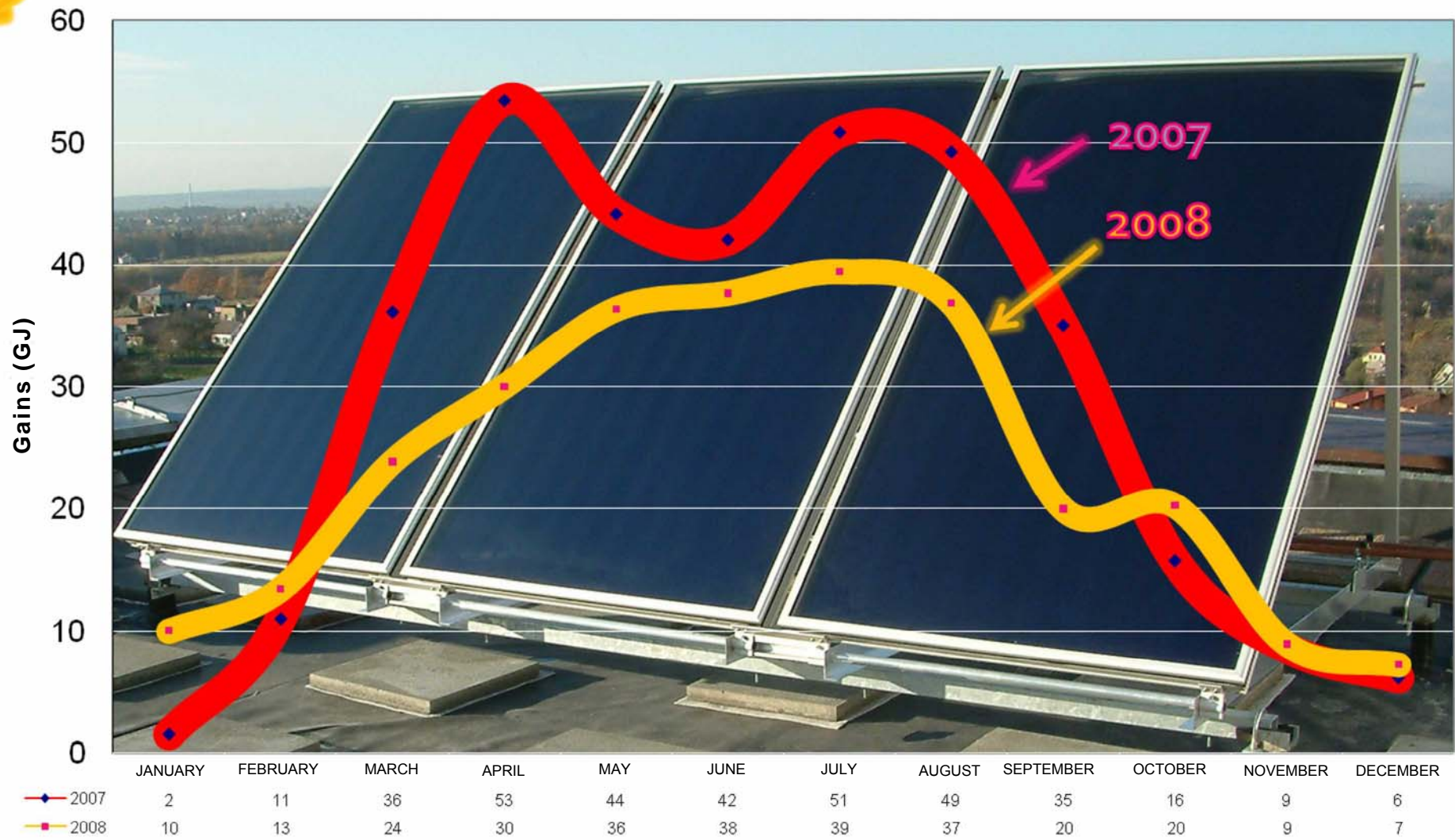


LAMPNÍ OHŘEVU
SLÁNNÍ ZÁSOBNÍK

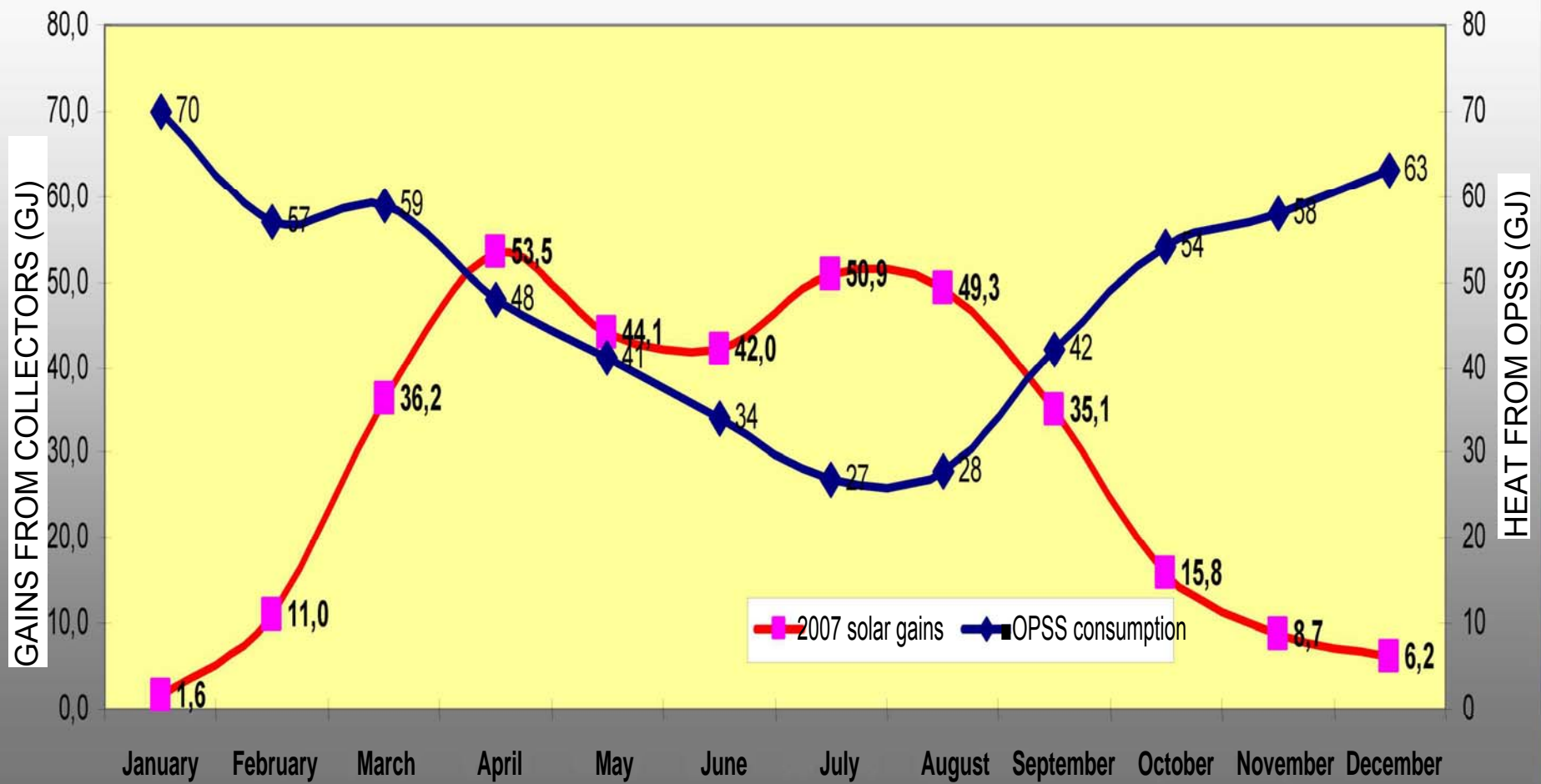
SLÁNNÍ ZÁSOBNÍK
LAMPNÍ OHŘEVU

REGULÁTOR
SOLÁRNÍHO
OHŘEVU

Heat gains from the solar system, housing nos. 954-956, years 2007-2008



Solar system share in TUV production (collectors-OPSS)



Orlová-Lutyně,
Na Stuchlíkovci,
nos. 697-699

Pre-heating for SV for TUV production
in OPSS

Number of flats connected: 42
Area of flats connected: 2243 m²
In operation since: 10 / 2007
Number of collectors: 40 pcs – 71 m²





Na Stuchlíkovci, nos. 697-699

- 42 flats**
- 2 243 m² of the floor area**
- 40 collectors i.e. 71 m²**
- Gains 230 GJ (in 2008)**
- At the price 400 CZK/GJ, profit 92 000 CZK**
- Realization cost 1 179 950 CZK**
- Dotation 500 000 CZK**
- RETURN 13 years (without dotation)**
7 years (with dotation)





Orlová-Lutyně,

Kpt. Jaroše nos. 783-784

Pre-heating of SV for TUV
production in OPSS

Number of flats connected: 28

Area of flats connected: 1483 m²

In operation since: 2 / 2008

Number of collectors: 24 pcs – 42 m²









Kpt.Jaroše, nos. 783-784

- 28 flats**
- 1483 m² of the floor area**
- 24 collectors i.e. 42 m²**
- Gains 135 GJ (in 2008)**
- At the price 400 CZK/GJ, profit 54 000 CZK**
- Realization cost 888 200 CZK**
- Dotation 320 000 CZK**
- RETURN 16 years (without dotation)**
11 years (with dotation)

Orlová-Lutyně, Masarykova
nos. 906, 907, 909, 910

Pre-heating of SV for TUV production in OPSS

Independent systems: 4

Number of flats connected: 54

Area of flats connected: 3 682,24 m²

In operation since: 8-9 / 2008

Number of collectors: 81 pcs - 142,6 m²





7/24/08











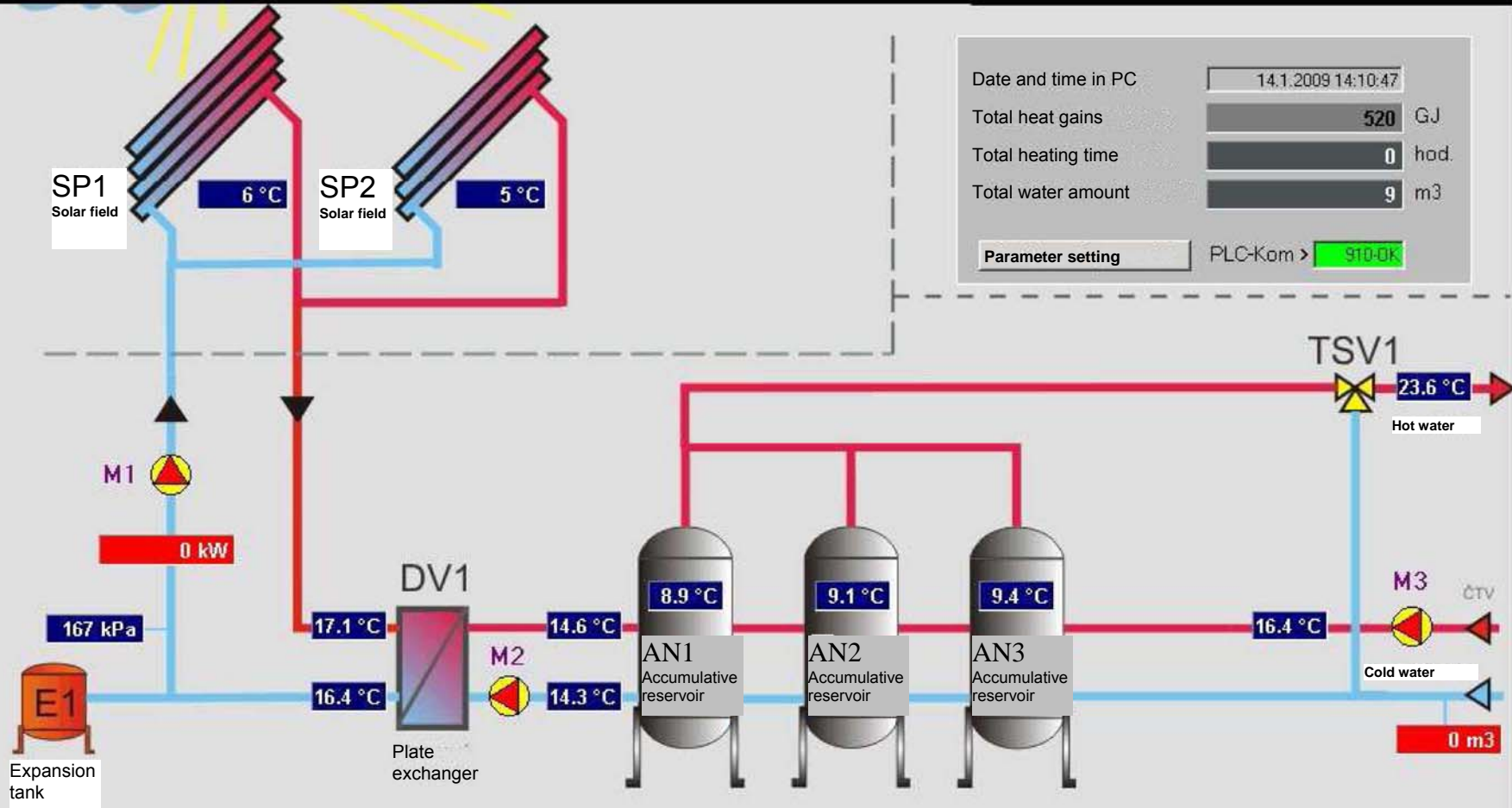








WWW.BDORLOVA.CZ



Date and time in PC	14.1.2009 14:10:47
Total heat gains	520 GJ
Total heating time	0 hod.
Total water amount	9 m ³
Parameter setting	PLC-Kom > 9T0-OK

Orlová-Lutyně,

Kpt. Jaroše, no. 791

Pre-heating of SV for TUV production in
OPSS + 2 pcs of air-water TC for heating

Number of flats connected: 23

Area of flats connected: 1310 m²

In operation since: 11 / 2008

Number of collectors: 3 pcs – 7,2 m²





3 x 30 tubes APRICUS



11/21/08

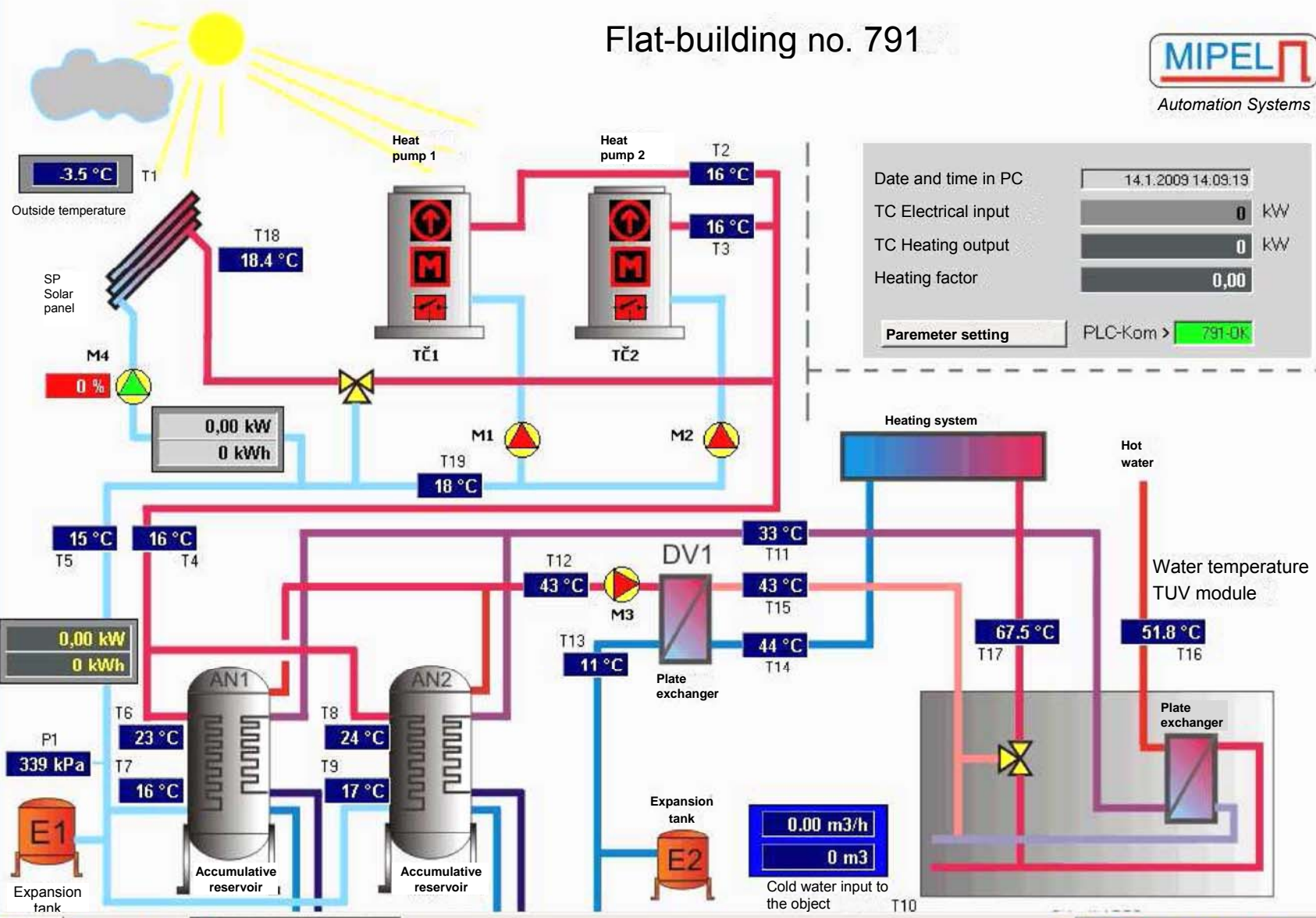
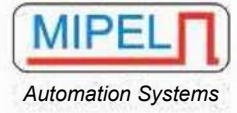


11/21/08





Flat-building no. 791



Date and time in PC: 14.1.2009 14:09:19

TC Electrical input: 0 kW

TC Heating output: 0 kW

Heating factor: 0,00

Parameter setting: PLC-Kom > 791-0K

Outside temperature: **-3.5 °C** (T1)

SP Solar panel

T18: **18.4 °C**

Heat pump 1

Heat pump 2

T2: **16 °C**

T3: **16 °C**

0,00 kW
0 kWh

T19: **18 °C**

T5: **15 °C**

T4: **16 °C**

0,00 kW
0 kWh

P1: **339 kPa**

T6: **23 °C**

T7: **16 °C**

T8: **24 °C**

T9: **17 °C**

T12: **43 °C**

T13: **11 °C**

Expansion tank E2

0,00 m³/h
0 m³

Cold water input to the object: T10

Heating system

Hot water

Water temperature TUV module

T17: **67.5 °C**

T16: **51.8 °C**

Plate exchanger

Orlová-Lutyně,
Kpt. Jaroše, nos. 777-778

Pre-heating of SV for TUV
production in OPSS

Number of flats connected: 28

Area of flats connected: 1483 m²

In operation since: 11 / 2008

Number of collectors: 24 pcs – 48 m²





1/28/06











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