

Solar collectors for hot water in hospitals - Polish experience



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GREEN SOLAR REGION PROJECT 1999-2004

MAIN IDEA :

introduction of the solar techniques to the Polish public buildings.

PROJECT BENEFICIENT:

hospital in Rawicz



**RAWICZ is a small town,
located on the west part of Poland**



INITIAL TECHNICAL SITUATION

4 STOREYS BUILDING, CONSTRUCTED BEFORE II WORLD WAR

- walls - red bricks - $U=1,35 \text{ W/m}^2\text{K}$
- roof - wood and roofing-tile - $U=6,28 \text{ W/m}^2\text{K}$
- windows - $U=3,0 \text{ W/m}^2\text{K}$
- doors - $U=3,5 \text{ W/m}^2\text{K}$
- heating cubature - $20\,160 \text{ m}^3$
- usage area - $5\,600 \text{ m}^2$
- 200 beds
- heat prepared in old, coal fired boilers

Daily water consumption

- 16- 18 m^3
- yearly demand for heat (hot water preparation) - 3 650 GJ
(efficiency $\eta= 40\%$)
- net energy for hot water preparation - 1 520 GJ

COMPLEX INVESTMENT

- **replacement of old, coal fired boilers with modern, gas fired one,**
- **new heating network - pipes and radiators,**
- **energy efficient PVC windows,**
- **building thermomodernisation,**
- **solar panels for hot water preparation**

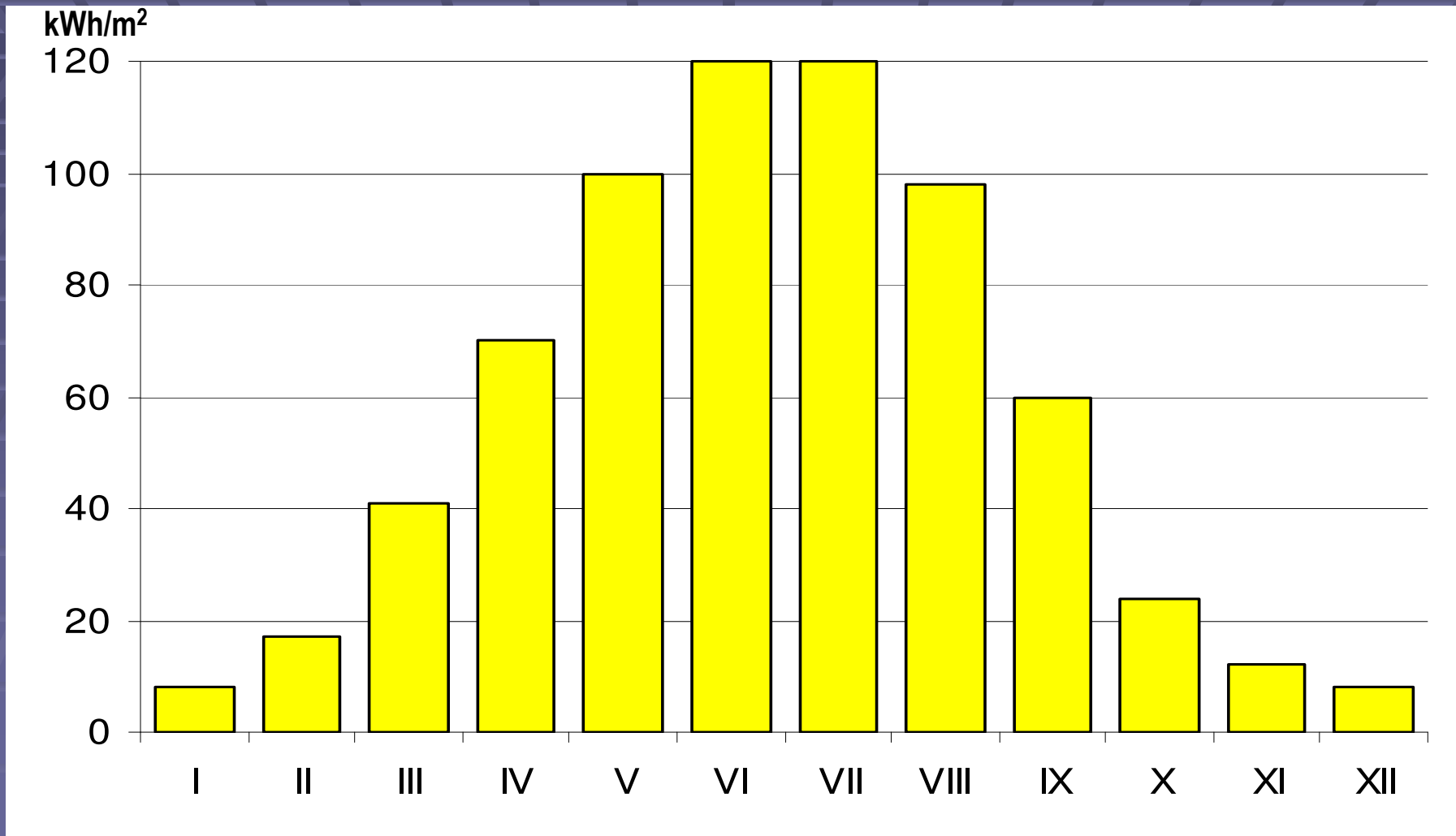




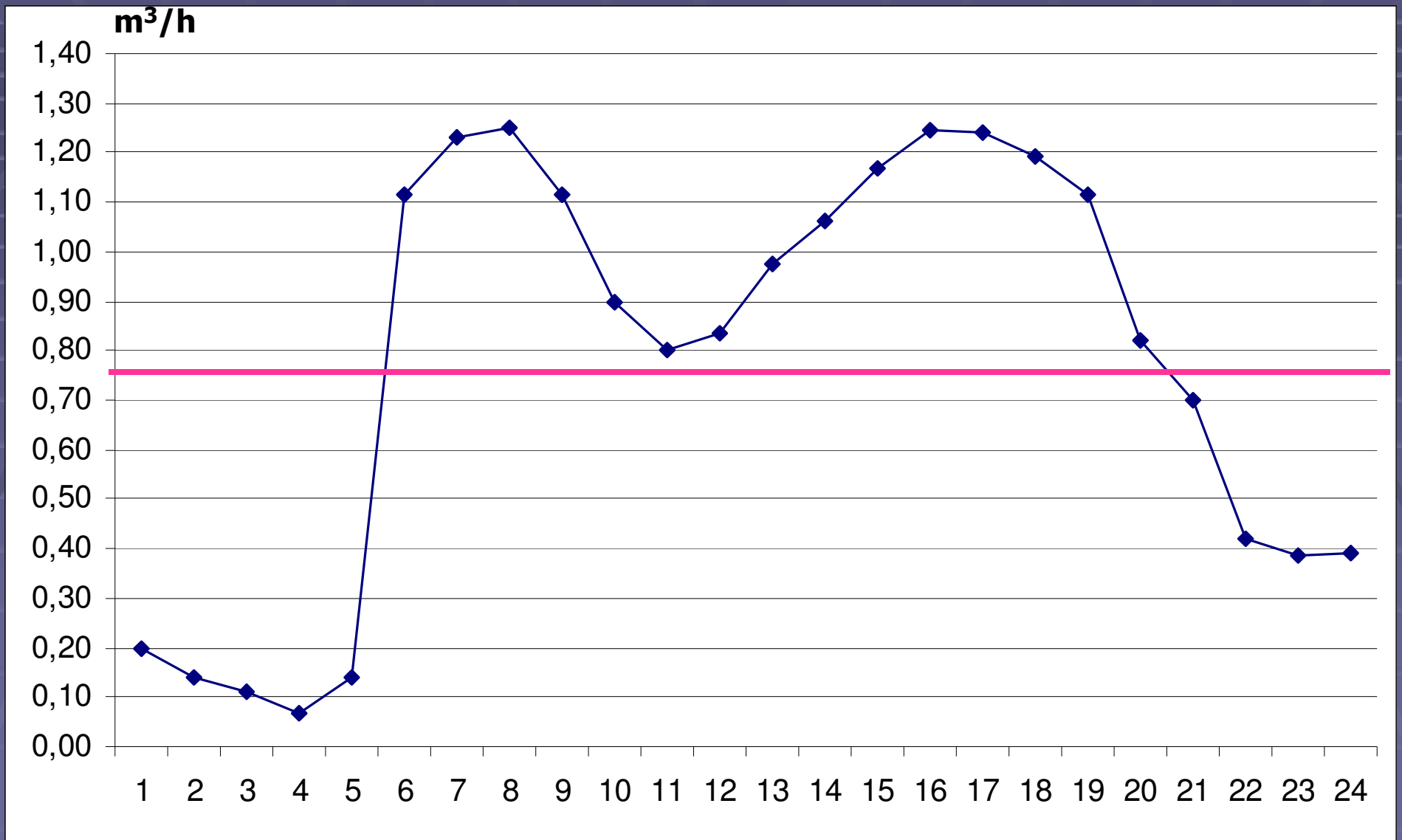
WHY HOSPITAL ????

SOLAR DENSITY in POLAND

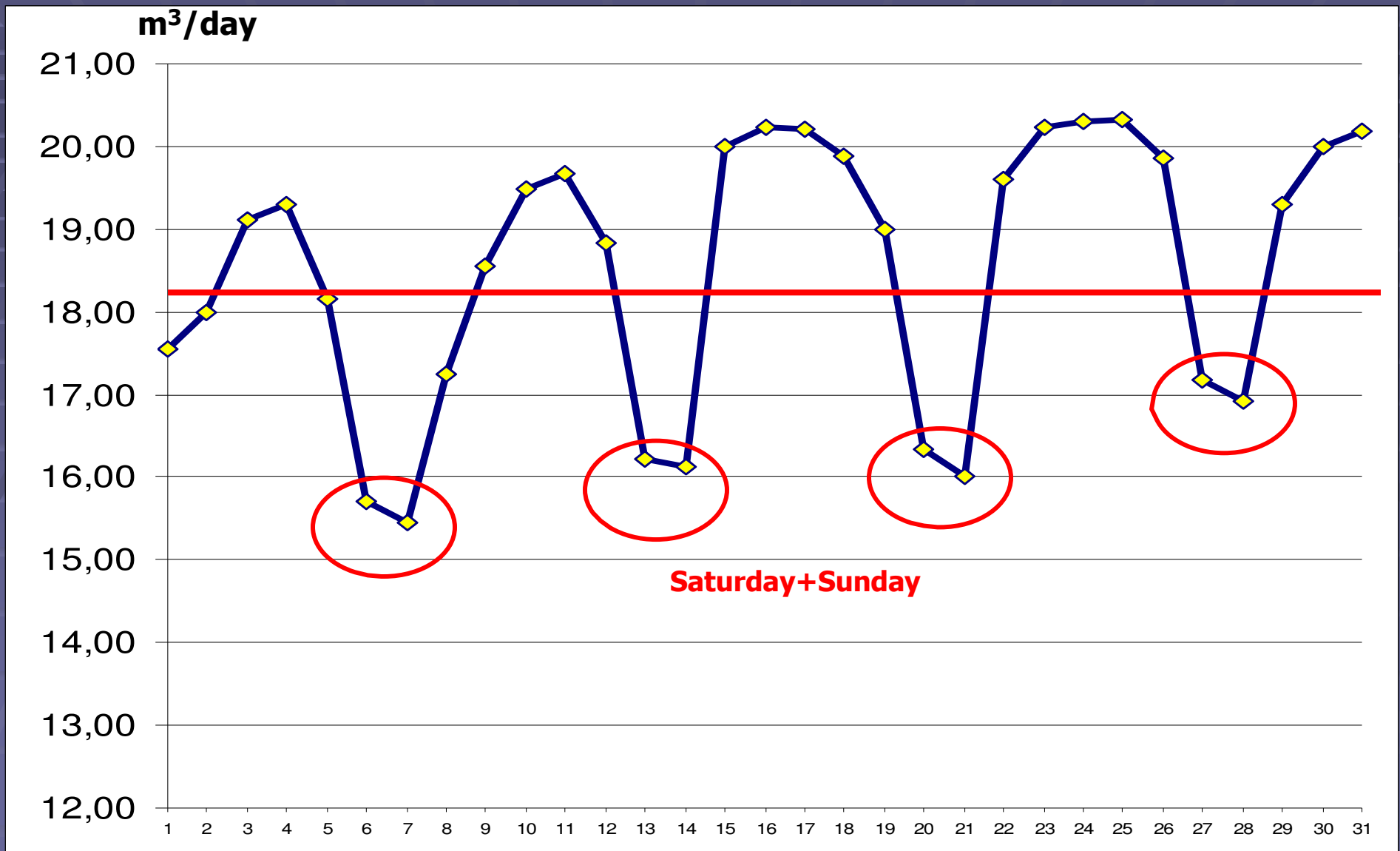
yearly average - 600 kWh/m²



DAILY CONSUMPTION



MONTHLY CONSUMPTION



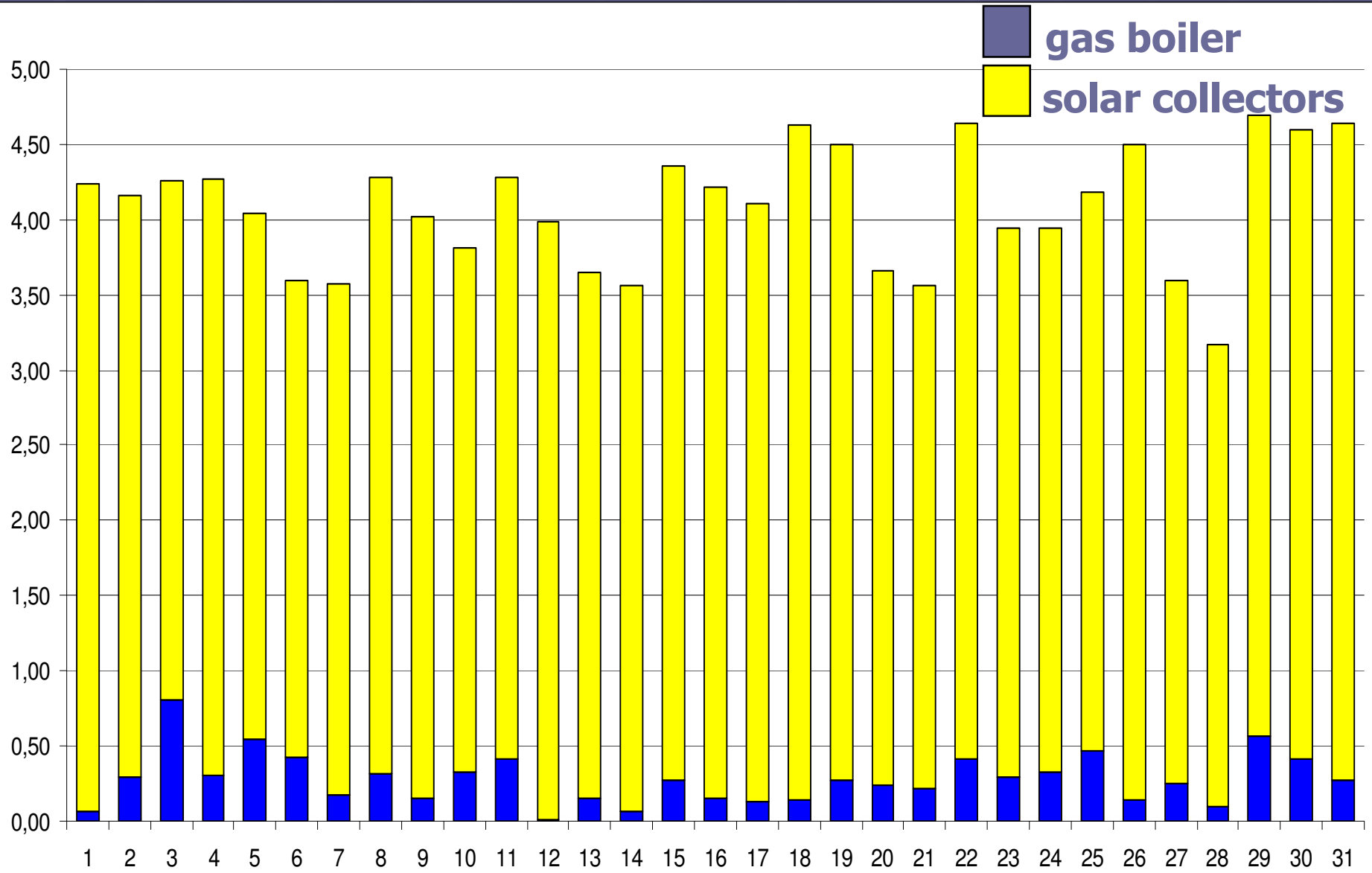


Solar installation

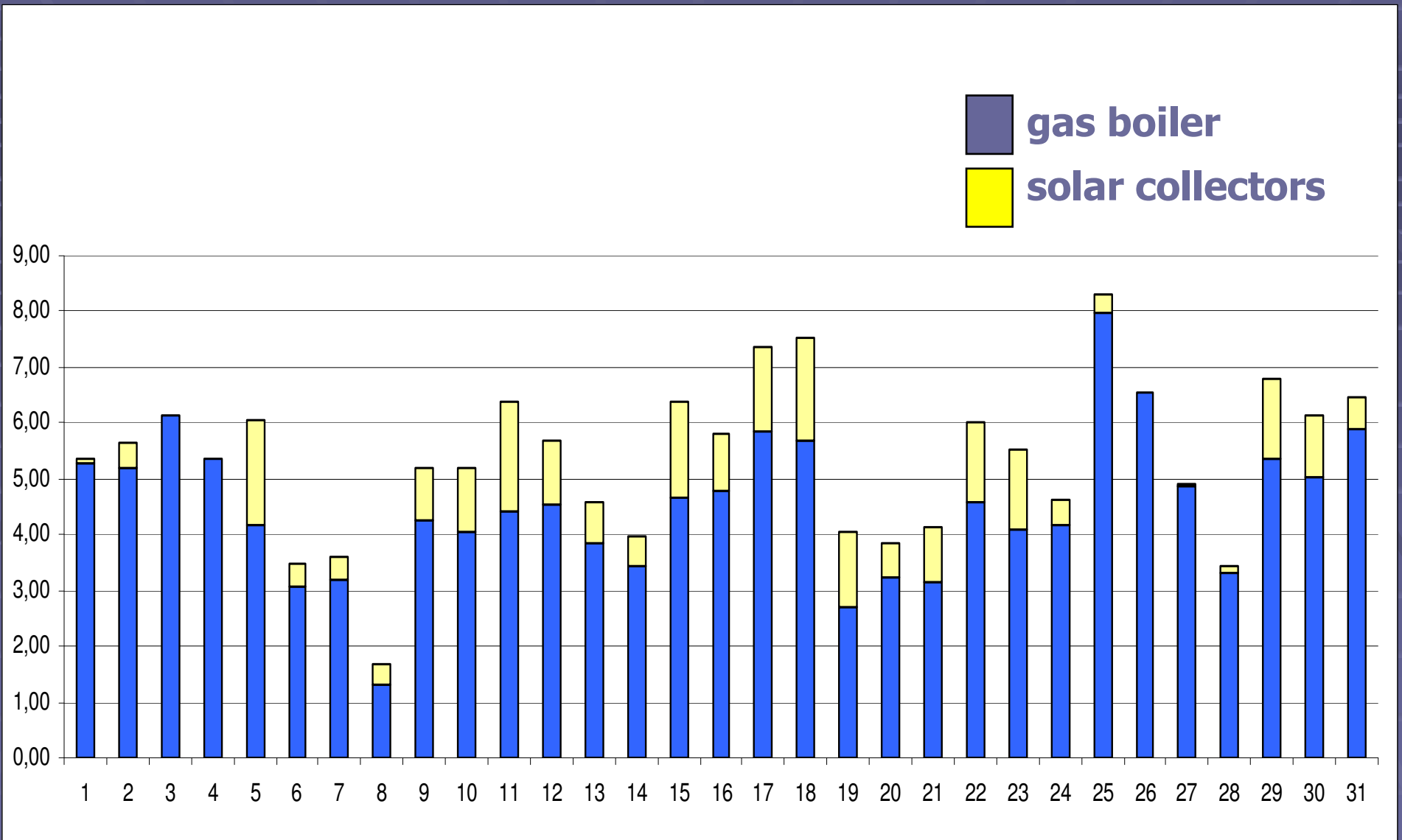
- 75 panels
- 234,8 m²



July 2004



October 2004



Month	Hot water consumption [m3]	Net energy from heating system [GJ]	Energy from solar collectors [GJ]	Total net energy consumption [GJ]	% of energy covered by the solar collectors [GJ]
I	612	133,21	7,87	141,1	5,6%
II	589	113,78	16,72	130,5	12,8%
III	563	89,45	40,34	129,8	31,1%
IV	522	51,47	68,87	120,3	57,2%
V	514	20,11	98,38	118,5	83,0%
VI	545	7,58	118,06	125,6	94,0%
VII	550	8,73	118,06	126,8	93,1%
VIII	542	28,53	96,41	124,9	77,2%
IX	557	69,37	59,03	128,4	46,0%
X	585	110,00	20,50	130,5	15,7%
XI	598	126,05	11,81	137,9	8,6%
XII	610	132,75	7,87	140,6	5,6%
TOTAL	6 787,0	891,0	663,9	1 564,6	42,4%

FINANCIAL DATA

		before	after
Hot water production in gas boilers	%	100 %	55 %
Production costs	zł/a	135 780	72 300
Reduction	zł/a	63480	
Solar panels investment costs	zł	332 352	
Payback time	years	5,23	



ENVIRONMENTAL IMPACT

<i>Pollutant</i>	<i>Unit</i>	<i>Before</i>	<i>After</i>	<i>Reduction in t/a</i>	<i>Reduction in %</i>
SO ₂	t/a	52,81	0,01	52,80	99,98
CO ₂	t/a	9 010,37	2 206,05	6 804,32	75,52
particulates	t/a	141,14	0,35	140,79	99,75
NO _x	t/a	12,33	1,86	10,47	84,95



