TRANS-SOLAR

HUNGARIAN NATIONAL REPORT

Innoterm

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A. Introduction

1. Overview of the country

1.1. Meteorology: temperatures, global daily radiation

Hungary's territory is about 97 000 km², located in Central-Eastern Europe. The capital is Budapest, where almost one fifth of the population lives.
The average temperature is the lowest during the winter months (December, January, and February). During these months the lowest average temperature is about -5 to -10°C, while the highest is about 4 to 5°C.
During summer months (June, July and August) the lowest average temperature is 14 to 19°C, while the highest average temperature is 21 to 25°C.
The absolute monthly minimum temperature is of course in winter and it is -25 to 30°C. The absolute monthly maximum is in summer time which is 35 to 42°C. The yearly average temperature is 9 to 11°C on the plain areas of the country but the fluctuation is relatively high 20 to 25°C.
The annual average precipitation is about 500 to 1000 mm; it is 500 to 600 mm in the plain (Alföld) and 800 to 1000 mm in the hills and mountains. Almost half of the fall is at winter in the form of snow.
The number of sunny hours differs between 1900 to 2150 hours in the different geographical regions of Hungary. The least sunny month is in December with 40 to 55 sunny hours while the sunniest is July with 250 to 300 hours. The sunniest hours are recorded in the plain (Alföld), while the least are in the hills/mountains.
Annual solar radiation differs between 4300 and 4700 MJ/m² in the different geographical regions of the country.
About half of the global radiation is diffused radiation and 75% of it reaches Hungary in the summer months. The yearly radiation in Hungary is between 1220 and 1325 kW/m². [*Source: Wikipedia]*

The map below shows the solar radiation of Hungary.

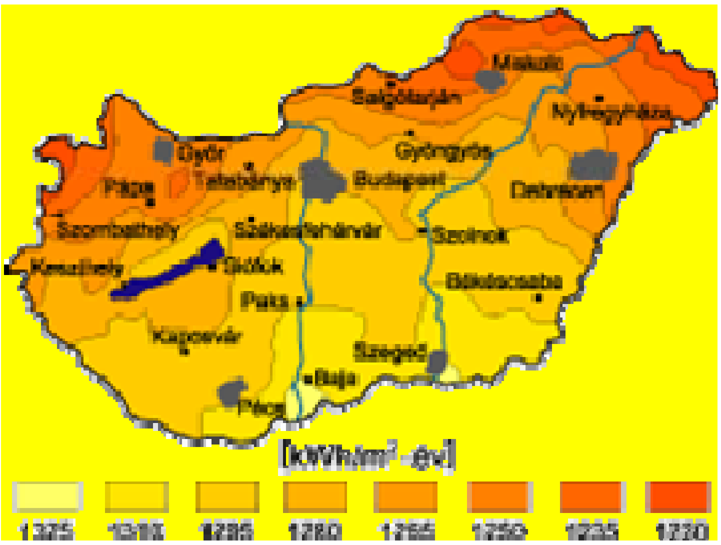

Figure 1: Solar Radiation in Hungary (Source: Naplopó Kft.)

The chart below shows the monthly solar radiation of Hungary. The measuring device is located at Budapest.

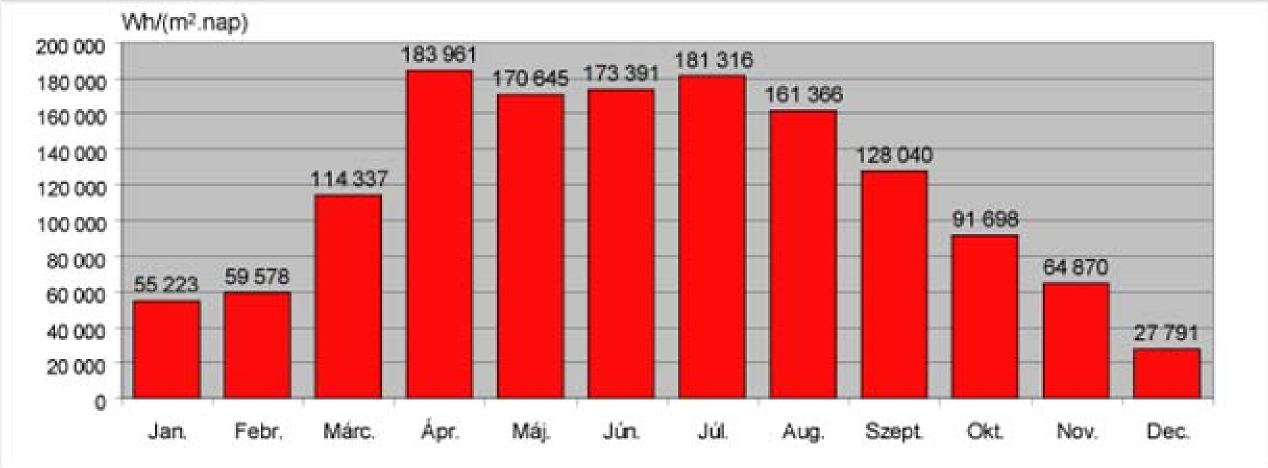

Figure 2: Solar Radiation at Budapest (Source: Naplopó Kft.)

1.2. Relief

There are no big differences in the relief of Hungary. The lowest point of the county is 78 meters above sea level. This point is close the Szeged in the southern part of the country. The highest point of Hungary is 1014 meters above sea level, which is located in the north-eastern part of the country. The peak is called Kékes.

The country can be divided into seven geographical region, which are the followings: Plain (1) (Alföld), Northern Low-Laying Mountains (2) (Északi-középhegység), Transdanubian Low-Laying Mountains (3) (Dunántúli-középhegység), Transdanubian Hills (4) (Dunántúli-dombság), Mecsek Mountens (5) (Mecsek Hegység), Small Plain (6) (Kis Alföld), Pre Alps (7) (Alpokalja). For the location of the above geographical regions please see the map below.

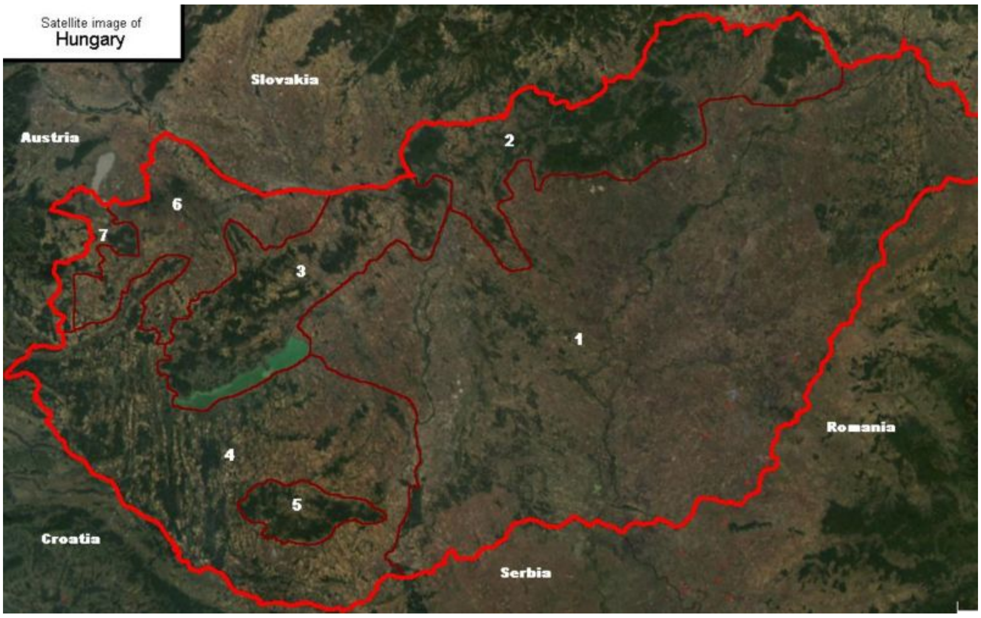

Figure 3: Satellite Image of Hungary (Source: Wikipedia)

70% of the country is good for agricultural production, of which 72% is for tillage.

The map below shows the relief of the country.

Figure 4: Map of Hungary (Source: Wikipedia)

1.3. Population: evolution for the last 10 years, actual situation and forecast

Table 1: Population of Hungary between 1999 and 2008 (Wikipedia)

Year	Population
1999	10232068
2000	10216205
2001	10200298
2002	10174853
2003	10142362
2004	10116742
2005	10097549
2006	10076581
2007	10066158
2008	10045000

The population of Hungary has been decreasing for several decades. It is a consensus that this trend will continue in the future as well. The population will be under 10 million within a few years.

1.4. Additional available statistics

The GDP of Hungary in 2007 was 136,4 billion USD as a total and 13 700 USD/capita. The GDP growth was also very slow in the last year. As you can see on the chart below the GDP growth (black line) started to decrease in 2004, while the lowest growth was reached in 2007. The chart below shows the actual or forecasted GDP growth and contributions of Hungary between 1996 and 2010.

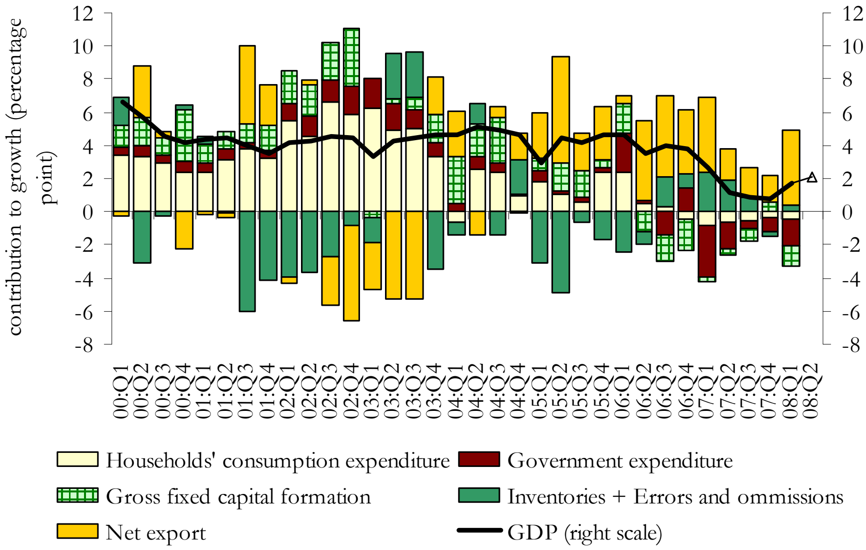

Figure 5: Contribution of items on the expenditure side to GDP growth* (seasonally adjusted data) (Source: Hungarian National Bank)

Last year's inflation (2007) was about 8%. It is expected that the inflation rate should be around 3% in 2010 but recent data indicates 7% (May 2007-May 2008), which is still too high. The table below shows perceived household inflation for the last 12 months and expectations for the next 12 months, as well as the actual inflation for the period of January 2002 and June 2008.

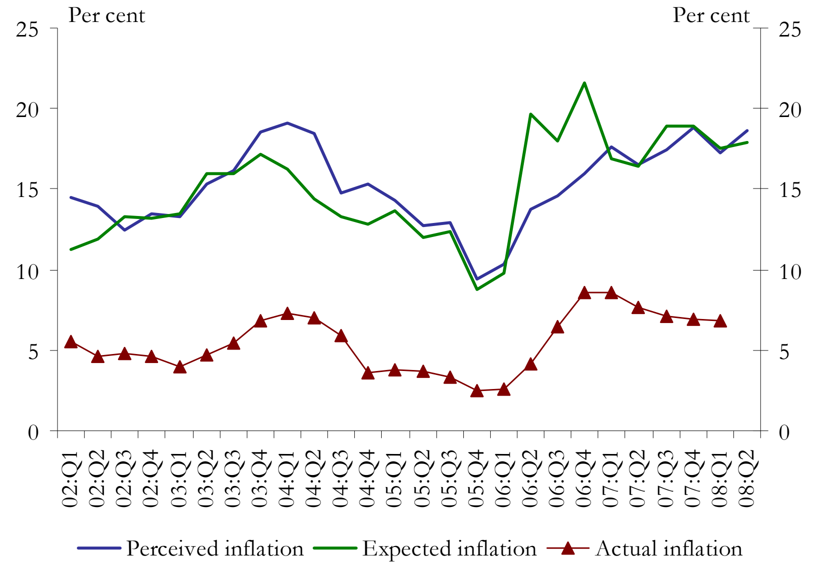

Figure 6: Households' Inflation Perception for the last 12 Months, and Expectations for the next 12 Months (Source: Hungarian National Bank)

Very strong price rises can be observed in the household natural gas price as the table shows below. The table covers the period from 1995 to 2009.

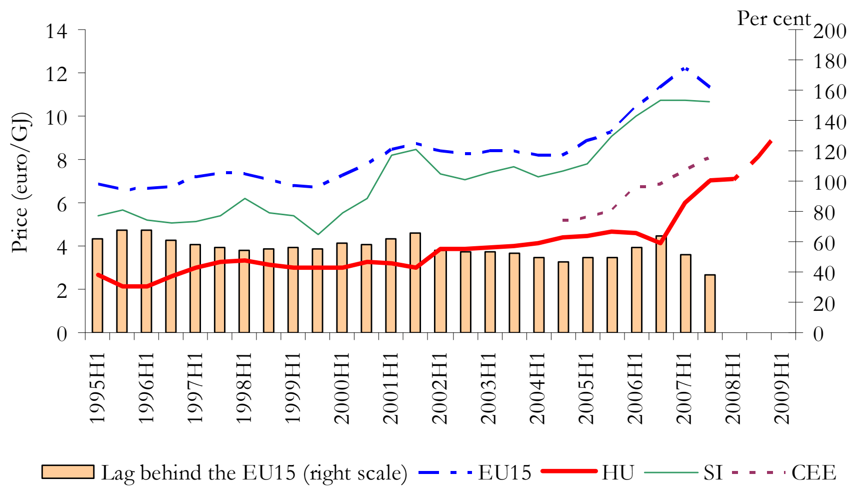

Figure 7: Household Gas Prices between 1995 and 2007 (Source: Hungarian National Bank)

Basically the same is true for electricity prices as well. Household electricity prices have been rising significantly. The table covers the period from 1995 to 2009.

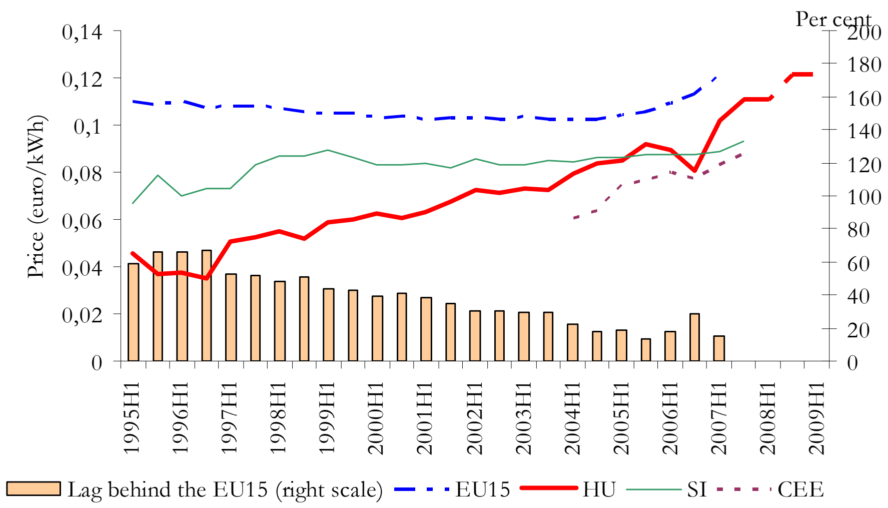

Figure 8: Household Electricity Prices between 1995 and 2007 (Source: Hungarian National Bank)

The overall average income is around 191 000 HUF/month (approx. 380 Euro) with taxes in 2007. There is a slight increase every year but the increase slowed down in the last years. [*Source: HVG (Heti Világgazdaság)]*

Hungary is not yet part of the Euro area. Currently there is no set date for joining the Euro and there is a market consensus that Hungary would not fulfil the requirements of Euro before 2012. Due to the fact that Hungary is not part of the Euro area the exchange rate is an important factor for importers such as solar thermal dealers. In the last months the exchange rate of Forint/Euro fluctuates between 260 and 280 Forint/Euro due to the worldwide economical crisis.

1.5. Statistic data of energy consumption, dependency energy imports, price evolution, forecast energy consumption, CO_2 emissions

Similar to many EU states Hungary depends on energy import since the country has limited energy sources. As it can be seen on the first chart, the net energy import has been increasing since 1990. Many households in Hungary changed their heating and domestic hot water production to natural gas. Furthermore a number of old coal power plants changed to natural gas as well. As a result the share of natural gas in the primary energy supply has been increasing since the beginning of the nineties. It can be seen at the second chart introducing Hungary's primary energy supply. The natural gas supply is covered mostly from Russian imports and secondly from small domestic productions.

The table below shows the energy balance of Hungary between 1990 and 2004.

Table 2: Energy Balance of Hungary between 1990 and 2004 (Source: Közlekedési, Hírközlési és Energiaügyi Minisztérium)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Primary energy production	**603,4**	**593,5**	**563,8**	**552,9**	**543,5**	**554,0**	**536,7**	**523,5**	**489,1**	**472,1**	**458,6**	**448,7**	**438,0**	**434,7**	**424,9**
Coal	188,2	178,8	151,6	132,9	128,1	130,2	134,3	138,1	127,5	125,7	121,1	118,2	111,1	113,4	91,4
Oil	104,8	100,9	98,8	93,7	90,6	95,8	88,2	81,5	76,8	74,2	69,9	65,2	62,3	67,0	64,2
Natural gas	159,6	161,2	151,3	162,9	157,2	158,6	150,8	140,7	124,1	109,9	103,6	103,7	101,6	95,7	99,1
Nuclear Power	137,3	137,3	139,6	138,0	140,5	140,3	141,8	139,7	139,5	141,0	141,8	141,3	139,5	120,0	129,9
Other 1/	13,5	15,3	22,5	25,4	27,1	29,1	21,6	23,5	21,2	21,3	22,2	20,3	23,5	38,6	40,3
Net. Import	**653,9**	**573,0**	**478,5**	**523,7**	**486,6**	**521,8**	**571,4**	**552,6**	**585,1**	**570,0**	**591,5**	**590,3**	**625,0**	**678,3**	**664,3**
Coal	39,2	77,6	24,5	23,8	19,0	15,3	17,3	14,8	9,7	11,2	13,9	11,1	12,4	38,0	44,5
Oil	262,4	201,0	225,5	249,3	227,8	222,8	199,4	221,7	249,6	218,5	217,0	199,2	185,8	194,2	200,8
Natural gas	216,5	207,9	172,2	199,5	189,1	231,6	304,2	274,2	296,4	306,3	304,9	325,9	363,8	416,2	388,5
Electricity	111,3	73,6	34,7	24,7	20,3	24,1	22,0	21,5	7,4	10,6	34,4	31,7	42,6	25,0	26,9
Other	24,5	12,9	21,6	26,4	30,4	28,0	28,5	20,4	22,0	23,4	21,3	22,4	20,4	4,9	3,6
Change in stock	**13,1**	**-13,0**	**-14,8**	**18,3**	**-12,5**	**8,7**	**27,9**	**23,1**	**28,4**	**-0,8**	**14,0**	**-30,4**	**8,0**	**21,4**	**1,1**
Primary energy supply	**1 244,2**	**1 179,6**	**1 057,2**	**1 058,4**	**1 042,6**	**1 067,1**	**1 080,2**	**1 052,9**	**1 045,7**	**1 042,9**	**1 036,1**	**1 069,4**	**1 055,0**	**1091,6**	**1088,1**
Coal	239,0	243,6	182,4	168,1	150,4	147,8	151,5	150,8	137,8	139,5	132,4	128,9	123,7	152,4	142,5
Oil	343,6	325,8	330,2	324,8	320,1	313,3	286,0	291,1	308,6	292,7	278,9	277,5	252,3	256,4	257,5
Natural gas	373,2	370,1	325,3	349,9	353,5	384,1	428,6	406,5	409,2	414,7	404,3	448,5	452,7	493,6	487,1
Electricity	250,4	212,8	175,9	164,4	162,4	166,0	165,9	163,4	148,4	153,4	178,0	174,9	184,1	145,6	156,8
Other	38,0	27,3	43,4	51,2	56,2	55,9	48,2	41,1	41,7	42,6	42,5	39,6	42,2	43,6	44,2

Remarkas: 1./ Primary energy production 'other' in 2003 and 2004 include 13-15 PJ energy from renewables

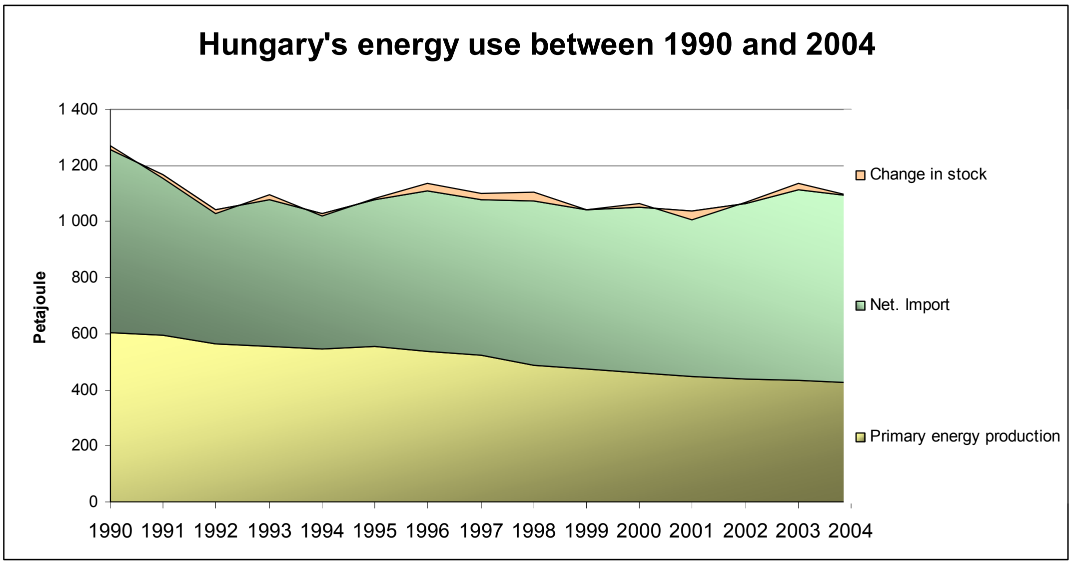

Figure 9: Hungary's Energy Use between 1990 and 2004 (Source: Közlekedési, Hírközlési és Energiaügyi Minisztérium)

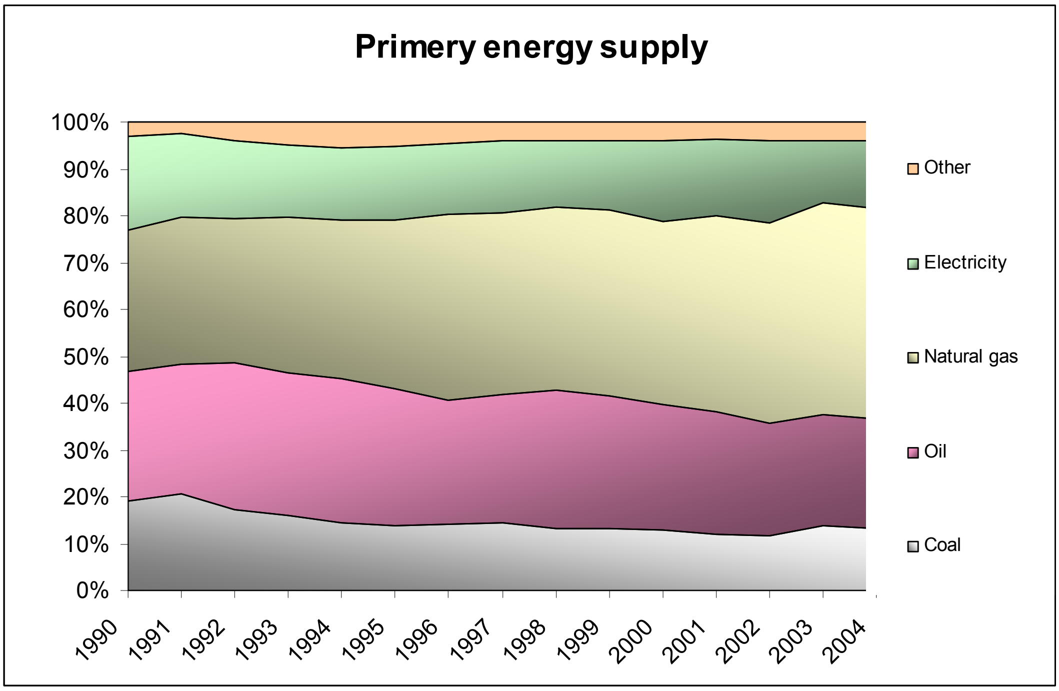

Figure 10: Primary Energy Supply of Hungary between 1990 and 2004 (Source: Közlekedési, Hírközlési és Energiaügyi Minisztérium)

Regarding forecast of energy supply of Hungary there are three scenarios for 2020 according to governmental documents. The first scenario is based on 2,5% GDP growth and 1% savings from energy efficiency. The second scenario expects 4,5% GDP growth and savings from energy efficiency would be 1,1%. The third scenario is also based on the same GDP growth as the second one but the savings from energy efficiency measures would be 1,5%. The forecasted primary energy demand in 2020 varies between 1170 and 1248 PJ/year.

	Input Data				**Forecast**										
		Gowht of Energy Demand / + 1% GDP		Energy Efficiency Measures	Primary Energy Demand in 2020										
	GDP growth	Primary Energy	Electricity	Electricity	Total	Renewables		Primary electricity		Liquid fossil fuels		Natural gas, PB		Coal, lignite, other	
	%	%	%	%	PJ/year	PJ/year	%	PJ/year	%	PJ/year	%	PJ/year	%	PJ/year	%
1st scenario	2,5%	0,401%	0,433%	1,0%	1248	186	14,9%	195	15,6%	286	22,9%	469	37,6%	112	9,0%
2nd scenario	4,5%	0,204%	0,220%	1,1%	1248	186	14,9%	195	15,6%	286	22,9%	469	37,6%	112	9,0%
3rd scenario	4,5%	0,165%	0,180%	1,5%	1170	186	15,9%	195	16,7%	260	22,2%	430	36,8%	99	8,5%

Figure 11: Primary Energy Demand of Hungary in 2020 (Source: Háttéranyag a 2007-2020 közötti időszakra vonatkozó energiapolitikai koncepcióról szóló, H/4858. számú országgyűlési határozati javaslathoz)

The next chart shows the CO_2 emission of Hungary between 1980 and 2004. As it can be seen on the chart there is a significant decrease in the CO2 emission but two periods must be distinguished. The first period was between 1980 and 1993 where a significant decrease of CO2 emission can be detected. The second period is between 1993 and 2004. There is no decrease but the values fluctuate between 55 and 60 Mt.

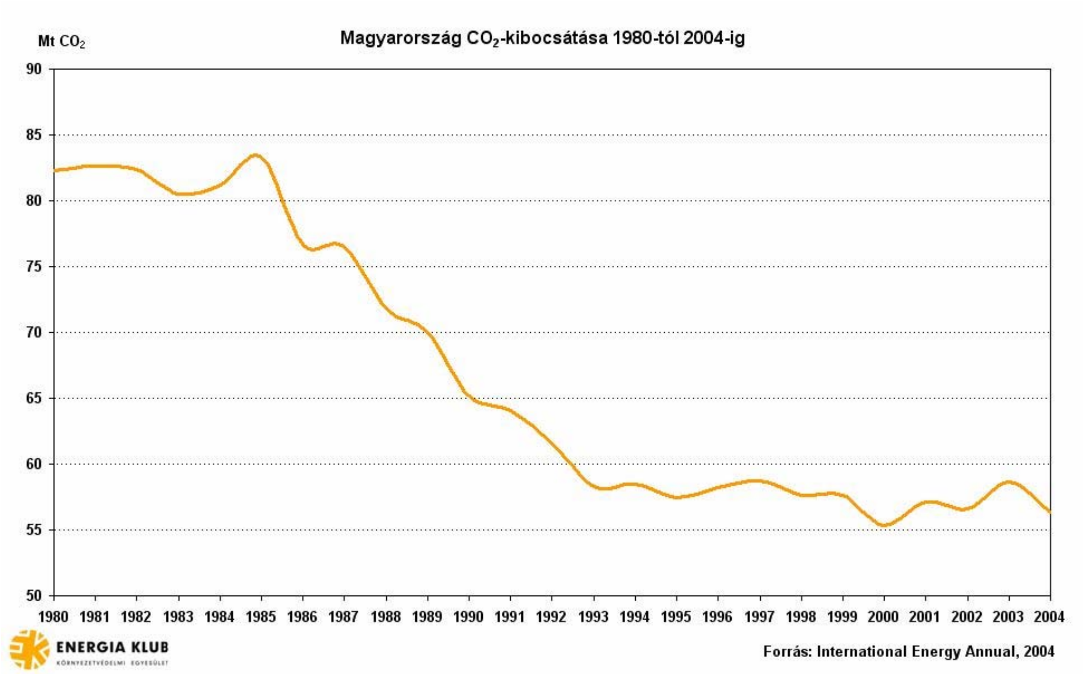

Figure 12: CO_2 Emission of Hungary between 1980 and 2004 (Source: Energia Klub)

The chart below introduces the CO_2 emission per capita of the European Countries in 2004. The y axis is given in tones CO_2 per capita. Hungary is marked with green column in the last part of the chart. The CO2 emission was 5.62 tons per capita in 2004.

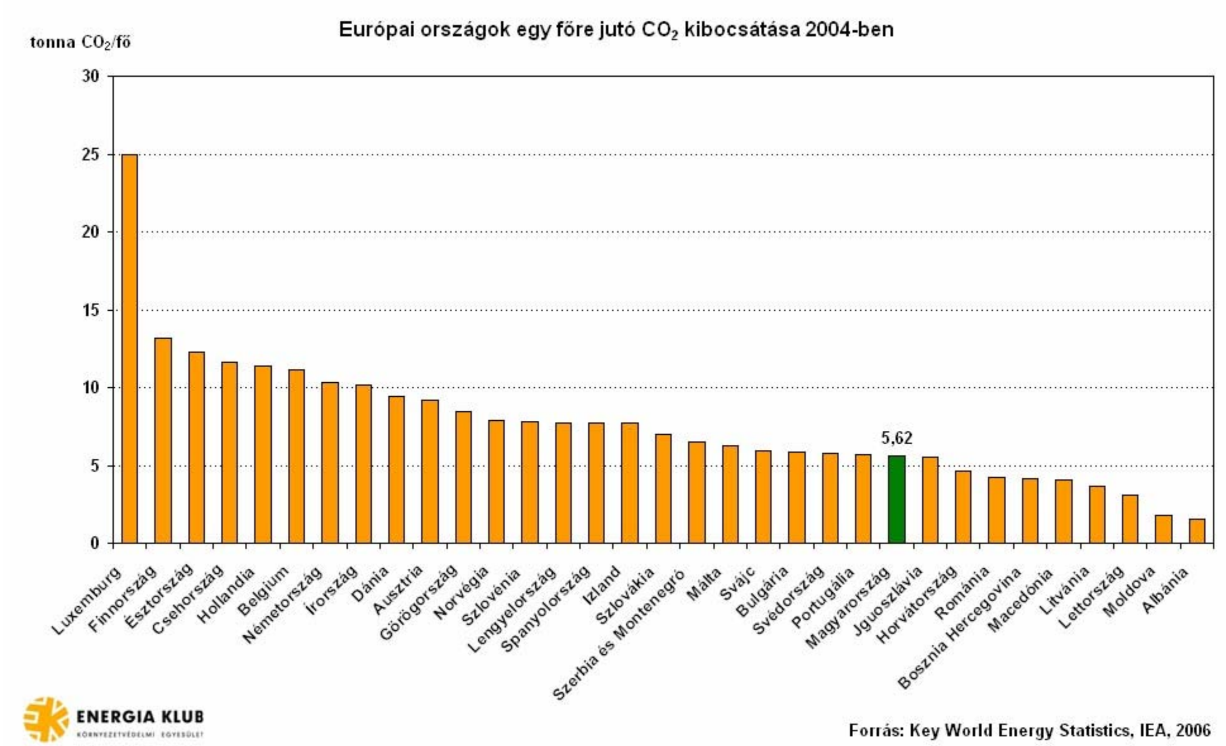

Figure 13: CO_2 Emission per Capita of European Countries in 2004 (Source: Energia Klub, Közlekedési, Hírközlési és Energiaügyi Minisztérium)State of the Market

2. Overview of the market situation

Until 1989 and the collapse of the communist regime, there were only house made ‘collectors’ on the market. These were mainly used at cottages and the installations were really different due to the selections of materials. The most commonly used one was a barrel painted to black and put on a stand. These installations were used for showering.
The new system did not bring a big change in this market. The country had serious economic problems. Due to this, only a only few environmentally-conscious people bought solar collectors.

In the second part of the nineties few Hungarian companies started to produce and/or sell solar collectors and/or solar panel but most of them went bankrupt by the beginning of the new millennium. On the other hand, some companies survived and they are still active on the market. It is important to mention that in the second half of the nineties there was not any financial support for the installation of solar collectors. As a result, only environmentally conscious people bought collectors. Another important factor was that the price of the conventional energy (natural gas, electricity) was cheap; therefore, one of the main driving forces was missing. On the other hand just a few developments, for example in hotels and industry, got financial support for installing solar thermal collectors but their visibility was really low.
According to the feedbacks from a questionnaire concerning the market solar market in Hungary, producers and dealers mentioned an important milestone around 2000 since this was the beginning of the solar market evolution in Hungary. Firstly many small installers/dealers/resellers entered the market although the demand was not so high. Many of these small stakeholders provided - and some still provide - misleading or false information about the products in order to increase their sales; this behaviour harms the market greatly.

The next milestone was set in 2004 when larger manufacturers started their sales in Hungary. These manufacturers chose different distribution strategies. Distribution of products can be divided into three categories according to their distribution strategy:
Most of the large manufacturers are present on the market with their own distributor company. The distributor provides marketing, education and training, consultancy and repair services. Furthermore the distributor sells the components and/or systems to the retailer. Distributors usually do not act as a retailer.
Some other companies follow the same manner and provide the above service but do not have retailers. They sell their products directly to the customers.
The third group of companies mixes the two techniques above but each of them provides training. Usually they act as distributor but also sell product directly to the customers, while they have a retailer network as well.
It is important to note that basically all of the larger manufacturers offer training for installers and retailers since this is the only way to ensure the quality of their products.
These companies provide correct information about the products, possible savings over conventional energy and payback period calculations.

2.1. Problems encountered

Natural gas is widely used for space heating and hot water production. Although the price of natural gas (and electricity, which is also widely used for hot water production) has been rising quickly in the last few years, the payback period of solar thermal systems is still to long. It must be mentioned that the Hungarian people very concerned about the price.
The financial support provided by the Hungarian State was very small. Basically it was easier to pay under the table for the installer/reseller/dealer and in this way ignore the VAT than do all the paperwork for meagre financial support. Last year the available funds was not all distributed due to the lack of proposals from inhabitants.

Due to historical and economical reasons there are relatively few environmentally conscious people in Hungary on one hand and on the other hand, people don't have the money to invest into solar systems. Therefore there is no major motivating factor for purchasing solar systems.
Another problem is the lack of information about the possibilities and concrete information. This is due to the fact that it is in some reseller/dealer's interest to introduce better conventional energy savings with shorter payback period.

2.2. Reasons of success or failure

Solar thermal systems are not widely used in Hungary due to the reasons above. On the other hand the financial support mechanism was changed in this year, which could enhance the wider utilization of these systems.
The continuous rise in the price of natural gas and electricity could also help the wider penetration of these systems.

2.3. Demonstration projects of high visibility

There are no demonstration projects of high visibility. There are some hotels, baths, etc. which use solar thermal systems but they are not 'advertised' widely - only locally.
One of the large department store chains installed solar collectors on 28 stores. Furthermore one of their stores is a demonstration project for solar cooling with 1000 m² of installed collector surface.
To sum it up there are demonstration projects but these are not financed from governmental funds and these are not highly visible.

2.4. Factors which affected the market during the last few years

Currently the market is about to change. Slowly but surely the unprofessional players are disappearing from the market and reliable dealers/installers/distributors would be active on the market. This is expected to influence the market positively.
Furthermore the media started to deal with global warming; in this way people get information about its importance. It is expected that it would affect the people's environmental consciousness in a positive way. On the other hand awareness creation is a long process, therefore it would take some time (years).

2.5. Description of the present situation

Basically all large manufacturers (Junkers, Vaillant, Hoval, Heliostar, etc.) are present on the market as well as Chinese producers. Most of the manufacturers provide trainings for installers and consultancy for interested people.

There are many resellers in Hungary. As it was mentioned before many of them provide misleading or false information about the possible conventional energy savings and payback period. As a result many customers become disappointed about the installed system since they expected greater savings of the conventional energy (practically natural gas and/or electricity) and therefore shorter payback period. On the other hand this behaviour is slowly disappearing; the majority provides correct and reliable information about solar thermal systems.
The production of the solar collector in Hungary is rather insignificant. Smaller producers are present on the market, but there is no information about them. Metallglass Zrt. started the production of solar collectors in 2007 but there is no information about its sales.
As it can be extracted from the Hungarian sales data in chapter 3, the market penetration of vacuum collector is between 40 to 50% and the same percentages are valid for flat plate collectors as well. The proportion of vacuum collectors is around 10% in other European countries, while the

market penetration of flat plate collectors is around 80%. This special Hungarian characteristic is due to the fact that the efficiency of vacuum collectors is considered higher by the public. On the other hand it is not necessarily true due to the great variety in quality of vacuum collectors. As a result some vacuum collectors have high efficiency but many of them have really poor quality and therefore their efficiency is lower than the efficiency of a standard flat plate collector.

2.6. Imports / exports figures

There were no exports from Hungary in 2007. Metallglass Zrt started producing collectors in Hungary in 2007. According to our estimation they sold about 100 m² of solar collectors in 2007 but there are no data existing about their export sales. Furthermore there are some other producers which produce their solar thermal systems in Hungary but there are no data about their export numbers. All in all the home production of the country is insignificant compared to the total sales.

2.7. Installers organization

There are two organizations which are dealing with solar thermal issues.

One is the Hungarian Sanitary Engineers Association (Magyar Épületgépészek Szövetsége – MÉGSZ). The association provides the flowing services:

- Organization of workshops, events (the next one is going to be in September 2008
- Training
- Publishing Intallateru magazine, which often deals with solar thermal issues

Magyar Napenergia Társaság (Hungarian Solar Energy Association) also an organisation specialised on the wider utilization of solar energy. Similarly to the Hungarian Sanitary Engineers Associations they organise conferences (the next one in September 2008), publish calls for “the best solar house of the year”, etc.

2.8. Types of solar systems

2.8.1. Flat-plate collectors

Flat-plate collectors are the most common collectors for residential water heating and space-heating installations. A typical flat-plate collector is an insulated metal box with a glass or plastic cover, called the glazing, and a dark-coloured absorber plate. The glazing can be transparent or translucent. Translucent (transmitting light only) low-iron glass is a common glazing material for flat-plate collectors because low-iron glass transmits a high percentage of the total available solar energy. The glazing allows the light to strike the absorber plate but reduces the amount of heat that can escape. The sides and bottom of the collector are usually insulated, further minimizing heat loss.
The absorber plate is usually black because dark colours absorb more solar energy than light colours. Sunlight passes through the glazing and strikes the absorber plate, which heats up, changing solar radiation into heat energy. The heat is transferred to the air or liquid passing through the flow tubes. Because most black paints still reflect approximately 10% of the incident radiation, some absorber plates are covered with ”selective coatings,” which retain the absorbed sunlight better and are more durable than ordinary black paint. The selective coating used in the collector consists of a very precise thin layer of an amorphous semiconductor plated on to a metal substratum.
Absorber plates are often made of metal, usually copper or aluminium, because they are both good heat conductors. Copper is more expensive, but is a better conductor and is less prone to corrosion than aluminium. An absorber plate must have high thermal conductivity, to transfer the

collected energy to the water with minimum temperature loss. Flat-plate collectors fall into two basic categories: liquid (figure 1) and air. And both types can be either glazed or unglazed.

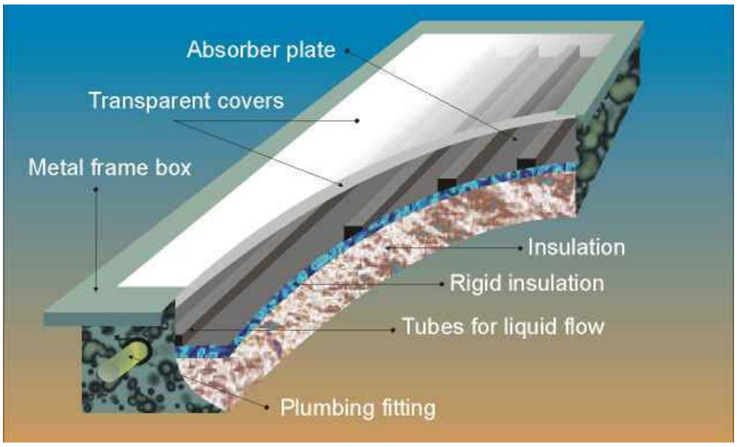

Figure 14: Typical layout of a flat plate collector (Source: CRES-TRASOL CD-Rom)

2.8.2. Liquid collectors

In a liquid collector, solar energy heats a liquid as it flows through tubes in the absorber plate. For this type of collector, the flow tubes are attached to the absorber plate so the heat absorbed is readily conducted to the liquid. The flow tubes can be routed in parallel, using inlet and outlet headers, or in a serpentine pattern. A serpentine pattern eliminates the possibility of header leaks and ensures uniform flow, but can pose some problems for systems that must drain for freeze protection because the curved flow passages will not drain completely.
The simplest liquid systems use potable water, which is heated as it passes through the collector and then flows to the house to be used for bathing, laundry, etc. This design is known as an *open-loop* (or *direct*) system. In areas where freezing temperatures are common, liquid collectors could use an antifreeze type of heat-transfer fluid. The transfer fluid absorbs heat from the collector and then passes through a heat exchanger, which generally is in the water storage tank inside the house, where it transfers heat to the water. Such designs are called *closed-loop* (or *indirect*) systems.

Glazed liquid collectors are used for heating household water and sometimes for space heating. Unglazed liquid collectors are commonly used to heat water for swimming pools. Because these collectors need not withstand high temperatures, they can use less expensive materials such as plastic or rubber. They also do not require freeze-proofing because swimming pools are generally used only in warm weather.

2.8.3. Air collectors

Air collectors have the advantage of eliminating the freezing and boiling problems associated with liquid systems. Although leaks are harder to detect and plug in an air system, they are also less troublesome than leaks in a liquid system. Air systems can often use less expensive materials, such as plastic glazing, because their operating temperatures are usually lower than those of liquid collectors.
Air collectors are simple, flat-plate collectors used primarily for space heating and drying crops. The absorber plates in air collectors can be metal sheets, layers of screen, or non-metallic materials. The air flows through the absorber by natural convection or when forced by a fan. Because air conducts heat much less readily than liquid does, less heat is transferred between the air and the absorber than in a liquid collector. Since air will not freeze, no heat exchanger is required.

In some solar air-heating systems, fans on the absorber are used to increase air turbulence and improve heat transfer. The disadvantage of this strategy is that it can also increase the amount of power needed for fans and, thus, increase the costs of operating the system. In colder climates, the air is routed between the absorber plate and the back insulation to reduce heat loss through the glazing. However, if the air will not be heated more than 17°C above the outdoor temperature, the air can flow on both sides of the absorber plate without sacrificing efficiency.
The best features of air collector systems are simplicity and reliability. The major limitations for the wide adoption of solar air heaters are the large collector area required due to the low density and specific heat capacity of the air compared to liquid heat transfer fluids, the extended air duct system required, the high power requirement for forcing the air through the collector, and the difficulty of heat storage. Promising ways to reduce the cost are the integration of the collector into the walls or roofs of buildings and the development of collectors which can be constructed using prefabricated components.

2.8.4. Evacuated-tube collectors

Evacuated-tube collectors heat water in applications that require higher temperatures. In an evacuated-tube collector, sunlight enters through the outer glass tube, strikes the absorber tube, and changes to heat. The heat is transferred to the liquid flowing through the absorber tube. The collector consists of rows of parallel transparent glass tubes, each of which contains an absorber tube (in place of the absorber plate) covered with a selective coating (figure 2). The heated liquid circulates through heat exchanger and gives off its heat to water that is stored in a solar storage tank.
Modular tubes can be added or removed as hot-water needs change. When evacuated tubes are manufactured, air is evacuated from the space between the two tubes, forming a vacuum. Heat losses are eliminated because there is no air to conduct heat or to circulate and cause convective losses. There can still be some radiant heat loss (heat energy will move through space from a warmer to a cooler surface, even across a vacuum). However, this loss is small and of little importance compared with the amount of heat transferred to the liquid in the absorber tube. This results in exceptional performance far superior to any other type of solar collector.

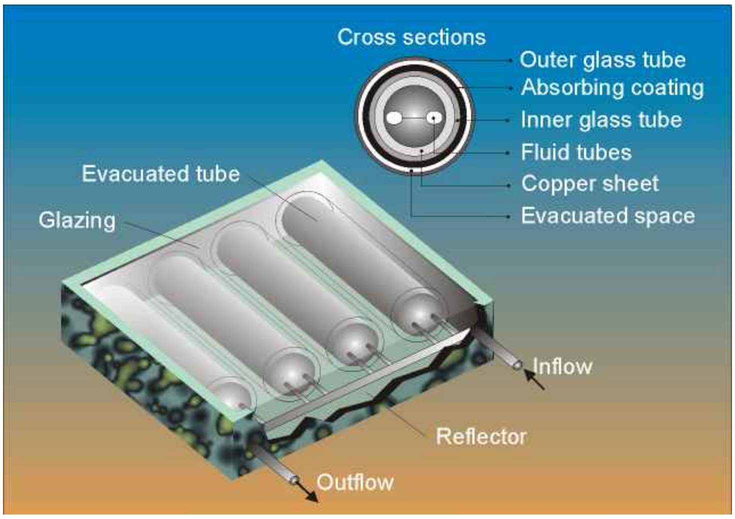

Figure 15: ***Schematic view of an evacuated tube collector*** **(Source: CRES-TRASOL CD-Rom)**

Evacuated-tube collectors are available in a number of designs. Some use a third glass tube inside the absorber tube or other configurations of heat-transfer fins and fluid tubes. One commercially available evacuated-tube collector stores 19 litres of water in each tube, eliminating the need for a separate storage tank. Reflectors placed behind the evacuated tubes can help to focus additional sunlight on the collector. Due to the atmospheric pressure and the technical problems related to the sealing of the collector casing, the construction of an evacuated tube collector is rather difficult. [*Source: TRANSOL, FIP-TREET]*

3. Solar collector production and sales

Table 3: Types of new solar thermal collector installed

Year	Flat Plate Collectors				Vacuum Collectors				Unglazed Collectors in m²
	Production and sales in m²				Production and sales in m²				
	A	B	C	D = A-B+C	A	B	C	D = A-B+C	
	Total national production	Exports	Imports	Total home market sales	Total national production	Exports	Imports	Total home market sales	Total home market sales
2004	1000		2520	3520			1035	1035	108
2005	1100		2822	3922			1950	1950	156
2006	900		5241	6141			6707	6707	212
2007	1000		8538	9538			11148	11148	398
Total	4000	0	19121	23121	0	0	20840	20840	874

The number of square meters of solar collectors per 1000 capita installed at the end of 2007 in Hungary is 4,4835.

As it can be seen from the table and the charts there is a strong increase in demand in the solar thermal market of Hungary. The market of flat plate collectors increased around 50% yearly in the last two years, while the increase of vacuum collectors was between 66 and 250% yearly in the last three years. Large increases were also seen in the unglazed collector market as well since the increase was between 35 and 88% yearly.

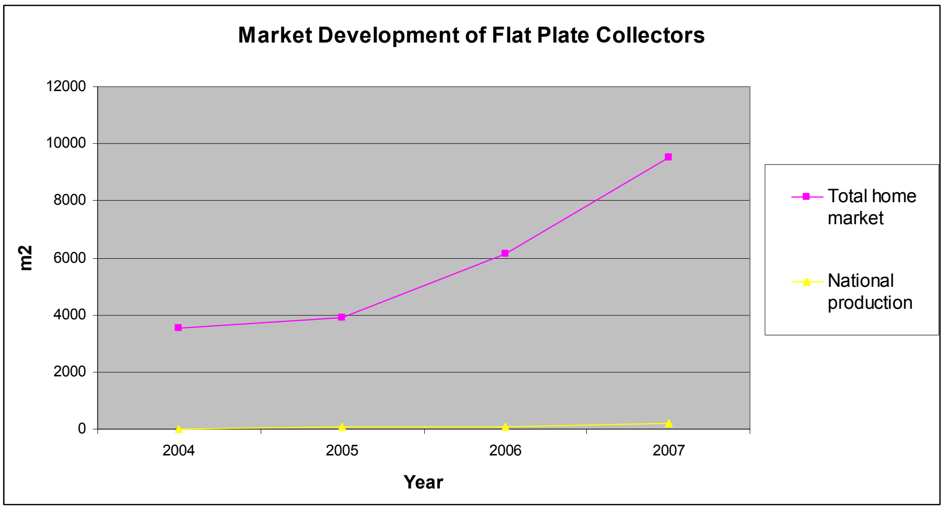

Figure 16: Market Development of Flap Plate Collectors

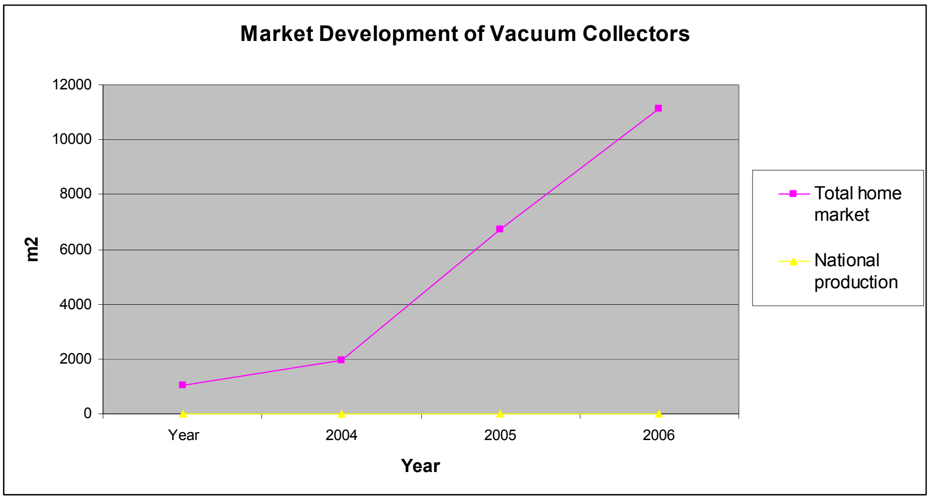

Figure 17: Market Development of Vacuum Collectors

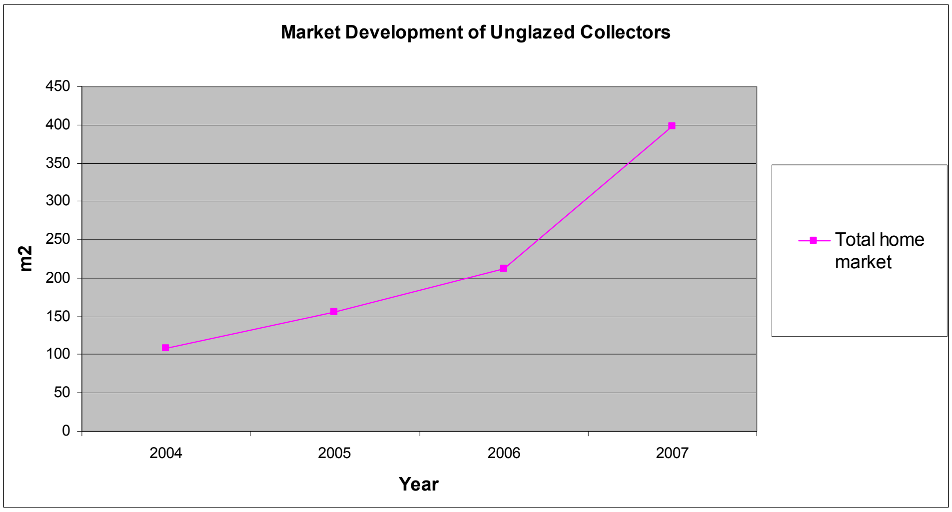

Figure 18: Market Development of Unglazed Collectors

Since there are no statistics for Hungarian solar collector sales available, the data are based on a survey and estimations. Innoterm contacted via email and phone the most important actors in Hungary which are listed under point 5. The majority of them sent back the requested information but some did not. In these cases Innoterm estimated their sales, based on their competitors and other sources of information.

According to Pál Varga's article titled 'A napkollektoros hőtermelés helyzete Magyarországon' there are 100 000 m² collector surface installed in Hungary. The total collector sales for Hungary in 2008 is approx. 30 000 m² according to the above-mentioned article.

3.1. Estimated solar park in working order in 2007/2006

There is no information about solar parks in Hungary.

3.2. Estimated annual solar thermal energy production in 2007

Flat plate collectors = 23 121 m² x 592 kWh/m²*year = 13 687 632 kWh/m²

Vacuum collectors = 20 840 m² x 657 kWh/m²*year = 13 691 880 kWh/m²

Unglazed collectors = 874 m² x 281 kWh/m²*year = 245 594 kWh/m²

Total 27 625 MWh/year

3.3. CO_2 emissions avoided in 2007 (on the basis of oil)

Flat plate collectors = 13 688 MWh/year x 0,3 tonnes/MWh = 4 106 tonnes/year

Vacuum collectors = 13 692 MWh/year x 0,3 tonnes/MWh = 4 108 tonnes/year

Unglazed collectors = 246 MWh/year x 0,3 tonnes/MWh = 73 tonnes/year

Total 8 287 tonnes/year

4. Product types and solar thermal applications

4.1. Product types

Description of the modules and systems used

4.1.1. Unglazed collectors

Used for:

- solar pool water heating
- for seasonal use only

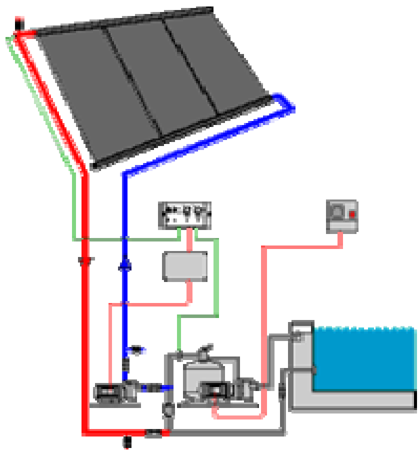

Figure 19: Unglazed Collector System (Source: Naplopó Kft)

4.1.2. Flat plate collector

Used for:

- DHW systems
- Space heating
- Combined systems
- DHW and pool water heating

- collector surface usually 2 m²/panel
- absorbers with selective surface; made of copper or aluminum

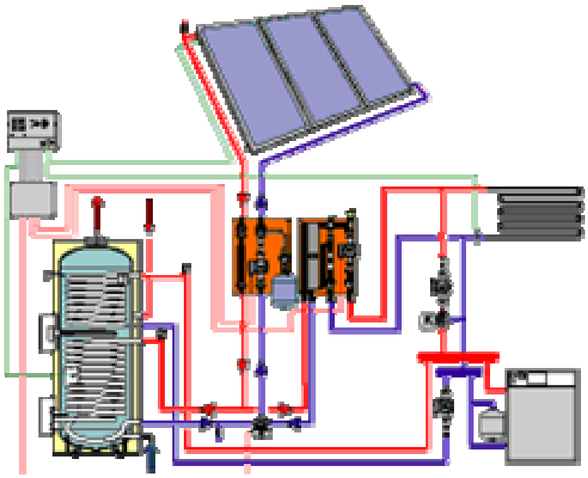

Figure 20: Flat Plate Collector System (Source: Naplopó Kft*)*

4.1.3. Vacuum collector

Using of this collector is considerably lower on account of its higher price

Used for:

- DHW systems
- Space heating
- Combined systems
- DHW and pool water heating

  - collector surface usually 2 m²/panel
  - collector glazing is safety glass

4.2. Applications

4.2.1. Domestic hot water production

Vast majority of the installed capacity is used for domestic hot water production since this is the most competitive utilization of solar power in Hungary. Unfortunately there are no numbers about the number of these systems.

4.2.2. Large collective solar systems

Large collective solar systems exist in Hungary but their number is very low. It is contradictory that these large collective solar systems would have a much shorter payback period than the solar thermal systems applied at family houses but it is not 'popular' in Hungary. Also financial contributions are available but the owners usually cannot agree on the distribution of costs of the new solar thermal system.

4.2.3. Space heating

It is possible to buy these systems in Hungary but this is very rare due to the long payback period. Only a few very environmental conscious people have it.

4.2.4. District heating

There is no district heating based on solar thermal energy.

4.2.5. Air conditioning and industrial process heating

According to our information there is no or very limited air conditioning and industrial process heating based on solar thermal energy. It is possible that there are few such systems but their number is really low and there is no available data about their exact number. It is due to the fact that its payback period is too long and the heat can be produced from other, cheaper energy sources.

5. Market share of major manufacturers

There is no information about share of major manufacturers.

6. Employment

It is important to mention that these numbers about employment are estimations due to the fact that there is no statistics about the employment figures of the solar thermal industry.

- Manufacturing of components of solar thermal systems: approx. 50
- Installation and maintenance: approx. 3000
- Distribution: approx. 36
- Sales and marketing: approx. 36 (excluding the staff of retailers)
- Testing, quality assurance and research: approx. 6
- Training: approx. 10
- Consultants: approx. 10

B. State of Production

7. Product technology and production methods

7.1. Product technology description

7.1.1. Collectors

- flat plate collectors with selective surface for domestic hot water production (usual size: 6 m²)
- flat plate collectors with selective surface or vacuum collectors for combined system (usual size: 12 to 16 m²)

7.1.2. The common materials and technologies used in Hungary

Absorber material

- copper absorbers
- absorber consisted of copper pipes with aluminum plates

Surface treatment

- selective layers

Insulation

- casing insulation usually made of FCKW free mineral wool, usually 40 to 60 mm thick
- pipes and fittings are insulated with several types of insulation materials

Transparent cover

- most of collectors have a transparent cover made of 4 mm thick safety solar glass

Casing

- casing made of polished aluminum

Storage tanks

- in most applications storage tanks are used for hot water storage
- monovalent hot water storage is usually used in those cases where the solar system is mounted into existing heating system
- bivalent hot water storage is used mostly in new applications (storage is prepared for additional heat source connection)
- although monovalent and bivalent storage tanks are available on the market storage tanks are usually equipped with two heat exchangers
- volume of hot water storage is different depending on parameters and operating mode of solar system
- insulated with FCKW-free material

Pump

- solar pump unit is usually used in solar systems. It consists of a pump, fittings, manometer, thermometer and relief valve. Solar pumps are usually insulated.

Expansion tank

- resistant against chemical incidence of glycol

- membrane usually made of rubber

Heat Exchangers

- usually two internal heat exchangers
- internal heat exchangers made of smooth or ribbed pipes integrated in storages

Additional heat source

- usually electrical heating elements are installed in the storage tank
- additional heat sources can beconnected to the heat exchanger (e.g. gas-fired boilers, gas-fired condensating boilers, solid fuel-fired boilers, biomass boilers) [*Source: Naplopó Kft., Vaillant]*

Specific solar gains in Hungary are around 600 kWh/m²/year for systems using flat plate collectors and approx. 660 kWh/m²/year for systems using vacuum collectors. Unglazed collectors' value is around 280 kWh/m²/year. Values are dependent on location and functioning of each system.

7.2. Product technology description

As it was introduced under point 3 the vast majority of solar thermal components and systems are imported.
According to our information there is very limited solar thermal production in Hungary. There are only a few companies which deal with solar thermal production such as Metall Glass Kft., PannonSolar Kft., etc. As far as it is known the production at MetallGlass Kft. started in 2007, while others have been active longer times but there are no data available about their production and sales. As a result there is no information about their product technology either.
According to our estimation their sales was only approx. 1000 m² in 2007.

8. Breakdown of solar systems costs

Table 4: Solar Systems Costs for Typically Sized Systems (Source: Naplopó Kft)

Solar Systems Costs for Typically Sized Systems		
250 HUF/Euro	**6m²**	**16m²**
Total costs (excl. VAT)	571 Euro / m²	469 Euro / m²
VAT (20%)	114 Euro / m²	94 Euro / m²
Total cost (incl. VAT)	**685 Euro / m²**	**563 Euro / m²**

Cost breakdown of an average solar hot water system:
- Main material/component supply 73%

- Pipes and installation 27%
- Cost breakdown of an average combined system:
- Main material/component supply 77%
- Pipes and installation 23%

Source: Naplopó Kft.

9. Typical solar domestic hot water systems

9.1. Typical DHW system for a single family house

- System type: drain back
- Collector type: heat –pipe vacuum tube collector
- Collector area (m²): Gross 4,4
- Collector area per person (m²/person): Gross 1,1
- Hot water storage (liters): 300 liter
- Price per m² system costs: HUF 180 000
- Amortization based on the present energy price: between 7-10 (in case of electricity) 10-13 years (in case of natural gas)
- Eventual subsidies: 25% of total system cost

Figure 21: Solar Thermal Collector at a Single Family House (Source: Kardos Labor Kft*)*

9.2. Typical DHW system for a dwelling

As it was mentioned it is not typical it is a ‘demonstration’.
- System type: n/a
- Collector type: Flat plate collectors
- Collector area (m²): 50
- Collector area per person (m²/person): 0,33
- Collector area per dwelling (m²/dwelling): 0,83
- Hot water storage (liters): approx. 3000
- Price per m² system costs: approx. 1800 Euro (250 HUF/Euro)
- Amortization based on the present energy price: 7-8 years
- Eventual subsidies: n/a

9.3. Typical DHW system for a hospital

- System type: non pressurized
- Collector type: all-glass vacuum tube
- Collector area (m^2): 250 m^2
- Collector area per person (m^2/person): 0,8 m^2/person
- Hot water demand at 60°C: 13 000 liter
- Hot water storage (liters): 10 000 liter
- Price per m^2 system costs: HUF 80 000
- Amortization based on the present energy price: 10 years
- Eventual subsidies: n/a

Figure 22: Solar Thermal Collector at a Hospital (Source: Kardos Labor Kft)

Figure 23: Solar Thermal Collector at a Hospital (Source: Kardos Labor Kft*)*

9.4. Typical DHW system for a hotel

- System type: drain back
- Collector type: heat pipe vacuum tube
- Collector area (m²): 44
- Collector area per person (m²/person): 0,6
- Hot water demand at 60°C: 1800 liter
- Hot water storage (liters) 2000 liter
- Price per m² system costs: HUF 150 000
- Amortization based on the present energy price: 9 years
- Eventual subsidies: n.a.

Figure 24: Solar Thermal Collector at a Hotel (Source: Kardos Labor Kft*)*

9.5. Typical consumer motivation

The people of Hungary are very price sensitive, especially when the price of the conventional energy has been constantly rising. As a result the main motivation is the price of the solar thermal compared to the conventional systems. It is especially true for owners of single family houses and dwellings. It is necessary to mention that the possible financial support is also important since that could lower the price of the new system.

The second most important factor is the possible saving of conventional energy sources - more precisely the money - which can be saved. This is rather true for the hospitals, hotels and others but it can be a motivation for owners of family houses and dwellings as well. It is especially right since the price of natural gas and electricity, which are the most important energies for heating and hot water production, has been constantly rising. According to economic forecasts the price of natural gas and electricity will be rising in the future as well.

There are relatively few people in Hungary who are environmentally conscious, which could be also a motivation for installing thermal solar systems. On the other hand their number is slowly but surely are rising. Some housing development projects advertise the new houses/flats as environmentally friendly, meaning that slowly there will be a large enough target group who feel responsibility for the environment.

10. Typical solar combined systems

As it was indicated above most of the solar thermal systems are used for hot water production. Although combined systems are available on the market their penetration is very limited.

10.1. Typical combined system in a hotel

- System type: non pressurized
- Collector type: all glass vacuum tube
- Collector area (m²): 170
- Heat storage (liters): 190 m² pool and DHW
- Pump: Grundfos UPS 40/120
- Expansion tank
- Heat exchanger
- Additional heating: boiler
- Collector area per heating load (m²/kW)
- Energy demand for hot water/heating: n/a
- Price per m² system costs: HUF 78 000
- Amortization based on the present energy price: 10 years
- Eventual subsidies: n.a.

Figure 25: Solar thermal Panel at a Hotel (Source: Kardos Labor Kft*)*

10.2. Typical consumer motivation

The typical customer motivation for combined system purchase is basically the same as the typical customer motivation for solar domestic hot water production systems. For more information please see chapter 9.5.

11. Conventional water heating and energy prices

Table 5: Conventional Energy Prices (Source: Innoterm)

Conventional Energy Prices		
Date: 2008	**Housing** VAT incl.	**Collective** VAT incl.
Electricity - normal	0,17 Euro/ kWh	0,17 Euro/ kWh
Electricity - discounted rate	0,16 Euro/ kWh	0,16 Euro/ kWh
Electricity – peak rate Electricity - low rate	0,19 Euro/ kWh 0,14 Euro/ kWh	0,19 Euro/ kWh 0,14 Euro/ kWh
Fuel - Oil	0,11 Euro/ kWh	0,11 Euro/ kWh
Bottled gas Natural gas	0,11 Euro/ kWh 0,05 Euro/ kWh	0,11 Euro/ kWh 0,05 Euro/ kWh
District heating (basic fee) District heating (heating fee) District heating total	0,02 Euro/ kWh 0,07 Euro/ kWh 0,09 Euro/ kWh	0,02 Euro/ kWh 0,07 Euro/ kWh 0,09 Euro/ kWh
Wood	0,02 Euro/ kWh	0,02 Euro/ kWh

Remarks:
The exchange rate applied is 250 HUF/Euro, although the exchange rate showed great fluctuation in the past few weeks.
Oil prices dropped in the last few weeks in Hungary, similarly to other countries in the EU, while other energy prices have reacted slower to the market price changes.
District heating prices are divided into two parts, namely basic fee and heating fee. The basic fee depends on the size on the flat since it is given in m^3. As a result the base of our calculation was an average flat of 60 m^3. (*Source: Főtáv, ELMÜ, Fővárosi Gázművek, Primagáz Zrt.)*

12. Standards and codes of practice

There is an obligation for collectors to be certified since these are construction materials.
The usual practice is that the producer gets the certificate for the product and sells the product to the dealer together with the certificate. This manner is true for the products of bigger EU-based manufacturers.
In the case the product origins from a third country (for example China), the importer has to get a certificate. The same applies for the very few Hungarian products as well.
Earlier this field has not been standardized in Hungary. Now several EN standards have been adopted and applied in Hungary. A list with a short description of the adopted standards is given below.

Table 6: Adopted Standards (Source: Innoterm)

Standard reference	Title
EN 12975-1 (2006)	**Thermal solar systems and components - Solar collectors - Part 1: General Requirements. Date of adoption: 01.07.2006.**
Short description	This European Standard specifies requirements on durability (including mechanical strength), reliability and safety for liquid heating solar collectors. It also includes provisions for evaluation of conformity to these requirements. It is not applicable to those collectors, in which the thermal storage unit is an integral part of the collector to such an extent, that the collection process cannot be separated from the storage process for the purpose of making measurements of these two processes. It is not applicable to tracking concentrating solar collectors.

Standard reference	Title
	Collectors that are custom-built (built-in, roof-integrated collectors that do not comprise factory made modules and are assembled directly on the place of installation) cannot be tested in their actual form for durability, reliability and thermal performance according to this standard. Instead, a module with the same structure as the installed collector is tested. The module gross area in the case of custom-built collectors shall be at least 2 m².
EN 12975-2 (2006)	**Thermal solar systems and components - Solar collectors - Part 2: Test methods. Date of adoption: 01.07.2006.**
Short description	This European Standard establishes test methods for validating the durability and reliability requirements for liquid heating collectors as specified in EN 12975-1. This standard also includes three test methods for the thermal performance characterization for liquid heating collectors. It is not applicable to those collectors, in which the thermal storage unit is an integral part of the collector to such an extent that the collection process cannot be separated from the storage process for the purpose of making measurements of these two processes. It is basically not applicable for tracking concentrating collectors, however thermal performance testing as given in clause 6.3 (quasi-dynamic testing) is also applicable to most concentrating collector designs, from stationary non-imaging concentrators as CPC's to high concentrating tracking designs. Parts of the solar radiation measurement have to be adjusted in the case of a tracking collector and in the case when a pyrheliometer is used to measure beam radiation. Collectors that are custom-built (built-in, roof-integrated collectors that do not comprise factory made modules and are assembled directly on the place of installation) cannot be tested in their actual form for durability, reliability and thermal performance according to this standard. Instead, a module with the same structure as the installed collector is tested. The module gross area in the case of custom-built collectors shall be at least 2 m².
EN 12976-1 (2006)	**Thermal solar systems and components - Factory made systems - Part 1: General requirements. Date of adoption: 01.05.2006.**
Short description	This European Standard specifies requirements on durability, reliability and safety for Factory Made solar systems. This standard also includes provisions for evaluation of conformity to these requirements. The requirements in this standard apply to factory made solar systems as products. The installation of these systems itself is not considered, but requirements are given for the documentation for the installer and the user which is delivered with the system (see also the clause 3).
EN 12976-2 (2006)	**Thermal solar systems and components - Factory made systems - Part 2: Test methods. Date of adoption: 01.05.2006.**
Short description	This European Standard specifies test methods for validating the requirements for factory made solar systems as specified in EN 12976-1. The standard also includes two test methods for the thermal performance characterization by means of whole system testing.
ENV 12977-1 (2001)	**Thermal solar systems and components - Custom built systems - Part 1: General requirements. Date of adoption: 01.10.2001.**
Short description	This European standard specifies requirements on durability, reliability and safety of small and large custom-built solar heating systems with liquid heat transfer medium for residential buildings and similar applications. The standard contains also requirements on the design process of large custom-built systems.
ENV 12977-2 (2001)	**Thermal solar systems and components - Custom built systems - Part 2: Test methods. Date of adoption: 01.10.2001.**
Short description	This European standard applies to small and large custom-built solar heating systems with liquid heat transfer medium for residential buildings and similar applications, and specifies test methods for verification of the requirements specified in ENV 12977-1. The standard includes also a method for thermal performance characterization and system performance prediction of small custom built systems by means of component testing and system simulation built systems. Furthermore, contains methods for thermal performance characterization and system performance prediction of large custom built systems. This European standard applied to the following types of small custom-built solar heating systems: ▪ Systems for domestic hot water preparation ▪ Systems for space heating only ▪ Systems for domestic hot water preparation and space heating This European standard applies to large custom-built solar heating systems, primarily to solar pre-heat systems, with one or more storage vessels, heat exchangers, piping and automatic controls and with collector array(s) with forced circulation of fluid in the collector loop. This pre-

Standard reference	Title
	standard does not apply to: ▪ Systems with a store medium other than water (e.g. phase-change materials) ▪ Systems for space heating with a distribution fluid other than water for the space heating sub-system (e.g. air systems) ▪ Small custom-built systems with a circulation line entering any store having a feedback on the solar heated store Principally, systems with circulation line may be tested in accordance to the methods described in this standard, if the connecting port for the circulation line is kept closed during the tests. This shall be, however, stated in the test report. ▪ Thermosiphon systems ▪ Integral collector-storage (ICS) systems
ENV 12977-3 (2001)	**Thermal solar systems and components - Custom built systems - Part 3: Performance characterisation of stores for solar heating systems. Date of adoption: 01.10.2001.**
Short description	This European standard specifies test methods for the performance characterization of stores that are intended for use in small custom-built systems as specified in ENV 12977-1. Stores tested according to this standard are commonly used in solar hot water systems. However, also the thermal performance of all other thermal stores with water as a storage medium (e.g. for heat pump systems) can be assessed according to this standard. The standard applies to stores with a nominal volume between 50 and 3000 litters and without integrated oil or gas burners.
EN ISO 9488 (1999)	**Solar energy - Vocabulary (ISO 9488: 1999).** **Date of adoption: 01.12.2000.**
Short description	This European – International Standard defines basic terms relating to solar energy.

The certification process can be done by appointed organisations such as

- Építésügyi Minőségellenőrző Innovációs Kht. (ÉMI Kht) H-1113 Budapest, Diószegi út 37. Phone/Fax: +36 1 372 6115, www.emi.hu
- ÉMI-TÜV Bayern Kft. H-2000 Szentendre, Dózsa György út 26., Phone: +36-26/501-120, Fax: +36-26/501-150, www.tuv-bayern.hu
- BME (Budapest University of Technology and Economics) Építőanyag és Mérnökgeológiai Tanszék Laboratóriuma, H-1111 Budapest, Műegyetem rkp. 3-9., Phone: +36 1 463 1111, Fax: +36 1 463 1110, www.bme.hu

The above three institutions work together in many cases.
There is a guideline for installation. Basically all of the manufacturers/dealers provide an installation guideline for their products. Furthermore these guidelines can be downloaded from their homepages. Most of the dealers provide training for the installers as well and the official magazine of Sanitary Engineers Association (Magyar Épületgépészek Szövetsége – MÉGSZ), named Magyar Installateru often deals with installation related issues. (*Source: Innoterm, ACCESS, Magyar Szabványügyi Testület, Magyar Mérnök Kamara)*

13. Level of R & D

13.1. Type of R & D activities

There is very limited R&D activity in Hungary since the solar thermal production of Hungary is insignificant. Although some organisations deal with R&D these organisations are mostly universities but and the activity is mainly focused on educational issues. There are two universities which are relatively active in solar R&D. These are:

- BME (Budapest University of Technology and Economics)
- Debreceni Egyedtem (University of Debrencen)

13.2. Specific programs

SOLANOVA – "Solar-supported, integrated eco-efficient renovation of large residential buildings and heat-supply-systems" started in January 2003. SOLANOVA is the first "Eco-buildings" project of the European Commission in Eastern Europe dealing with a "major renovation" of large existing buildings. Thus SOLANOVA serves as best practice example for the proper implementation of the European Union's Energy Performance of Buildings directive. Ongoing renovations of the huge stock of large residential buildings only result in minimal non-sustainable improvements. In order to achieve sustainable improvements, SOLANOVA proposes a symbiosis of three strategies:

- design for human needs
- optimised resource efficiency of the building
- optimised solar supply.

In 2005, one seven-story panel building in the Hungarian town Dunaújváros has been transformed into Europe's first 3-litre-panel-building by consequently applying the passive-house-philosophy to an extent, which was judged to be best practice for retrofit. Overnight solar energy provides more than 20% of the total consumption for space heat and domestic hot water. Mainly this is due to a drastic decrease of space heat consumption, which was 220 kWh/m² before retrofit.

- Measured annual space heat consumption 2005/06: 40 kWh/m² - a decrease of more than 80%!
- Measured annual space heat consumption 2006/07: 20 kWh/m² - a decrease of more than 90%!

In Eastern Europe ca. 100 Million people live in large panel buildings. But SOLANOVA's findings may be easily transferred to the large stock of Western European panel buildings and to any other kind of large residential buildings, too. (*Source: www.solanova.eu)*

13.3. Level of financing by industry and public funds (EU incl.)

It is very limited since the solar collector production of Hungary is insignificant. As a result private companies do not really deal with R&D but of course there are some exceptions. According to our estimation about 50% of R&D is done by the private sector, while the other half is done by universities for mainly educational reasons.

13.4. European funding of R&D

There are several opportunities for R&Đ provided by the EU such as the 7th framework programme and the Intelligent Energy – Europe programme. Some Hungarian organisations use these opportunities for funding R&D but their number is very limited.
Furthermore there are programmes which are financed by the EU and by the Hungarian State as well. These also provide opportunities for solar thermal-related R&D. These are Gazdaságfejlesztési Operatív Program (GOP) 111 and 131. It is important to mention that these programs focus on R&Đ in general but there is the opportunity to get co-financing for solar thermal R&D.

13.5. National funding of R&Đ

Besides EU funds there are some opportunities for solar thermal R&Đ from Hungarian funds. These are financed fully by the Hungarian State. These programs are the INNOCSEKK+ and Nemzeti Technológiafejlsztési Program. Similarly to the EU and mixed funds, they are focusing on R&D, not specifically on solar thermal R&D.

C. State of Marketing

14. Distribution and marketing methods

Distribution of products can be divided into three categories according to their distribution strategy. Most of the large manufacturers are present on the market with their own distributor company. The distributor provides marketing, education and training, consultancy and repair services. Furthermore the distributor sells the components and/or systems to the retailer. Distributors usually do not act as a retailer.

Some other companies follow the same manner and provide the above service but do not have retailers. They sell their products directly to the customers.

The third group of companies mixes the two techniques above but each of them provides training. Usually they act as distributor but also sell product directly to the customers, while they have a retailer network as well.

It is important to note that basically all of the large manufacturers have training for installers and retailers since this is the only way to ensure the good quality of their products.
There are not available data about the marketing methods of solar systems in Hungary. As a result the information about the used marketing methods are really limited and based mainly on empirical data.

There is no advertisement in the mass media most likely because the advertisement costs in radios, TVs, billboards, etc. would be too high for the stakeholders.
On the other hand all the bigger dealers/resellers/installers are present on the Internet. Each of them has a fairly informative homepage where product information can be obtained. Furthermore these companies provide the preparation of the application form for the National Energy Efficiency programme, which is a great help for possible customers since in this way they don't have to do the paperwork and get financial support for solar installations themselves.
Some of the dealers/resellers/installers are present at the environmental fairs (RENEXPO, etc.) with solar collectors or systems but only bigger companies can afford the relatively high cost of the presentation.
Moreover some of the dealers/resellers/installers organise trainings and workshops for installers in order to provide the necessary information about their products.
A number of dealers/resellers/installers are active in the scientific media. They publish articles about projects, new products and systems as well as calculations about possible savings and payback periods. Unfortunately these articles reach only interested people and are not widespread.
Regarding guarantees it depends on the company since it is not compulsory to give guarantees for a product. On the other hand it can be a good marketing tool since a long guarantee enhances the trust of the customer towards the product.

15. Incentives and financing methods

15.1. What kind of financial incentives have been used in the past and are used presently and at what level

The National Energy Efficiency Programme was created several years ago and aims to reduce the energy use of households by energy efficiency measures and to support the installation of renewable energy sources. The program is nationally coordinated by Energiaközpont, which is a state owned organisation. The programme was changed several times in the past few years, but the overall aim of the programme remained the same. Mostly the share of financial contribution was changed. Firstly it was such a success story since the funds allocated were almost immediately distributed among the applicants. Later the financial contribution was decreased but the financial contribution was smaller than the VAT. Therefore it was easier to pay under the table and ignore VAT than do all the paperwork to get the financial support. As a result there was no interest from the public to get the financial contributions; therefore recently the financial contribution was increased.

Currently there is only one program which supports financially the installation of renewables (including solar thermal systems) and energy efficiency measures. As it was mentioned above this program is nation wide.

National Energy Efficiency Programme (Nemzeti Energiahatékonysági Program)

The main aim of the National Energy Efficiency Program is to increase the renewable energy utilizations in properties. It means in practice investments, which replace traditional energy sources with renewable energy sources, and to establish thermal energy or electricity producer capacity from renewable energy sources, or to establish the utilization of biomass, geothermal energy, wind energy, organic waste, and to establish thermal collectors and solar cells.
The overall available funding for financing the supported activities below is 1.6 billion Ft (6,5 million Euro). It is expected to financially support 5000-6000 applications from the fund available for these calls.
The financial subsidy can be a maximum of 30% of the investment up to 1.200.000,-Ft (cc. 4.800 Euro) per flat. By the tender the applicants will be entitled to the credit application under the „ Successful Hungary" Energy Saving People of Hungary Credit Program. The own co financing has to be at least 70%, but it can be covered from the „ Successful Hungary" Energy Saving People of Hungary Credit program (for more details please refer to the bank loans at preferential conditions below).

The applicants:
- Natural persons,
- Cooperative flats and
- Apartment houses

It means that not only flats of individual owners can apply but also apartment houses, which is important since the possible saving and payback period is better for apartment houses than for family houses or individual flats.

The supported activities:
- Flats, houses, etc. built with industrialized or traditional technology before 1994, which are subject to change or modernization of heat isolation of windows/doors,
- Flats, houses, etc. built with industrialized or traditional technology before 1994, which are subject to change or modernization investments of the existing heating and/or domestic hot water- supply appliances,
- Flats, houses, etc. built with traditional technology before 1994, which are subject to change or modernization of insulation
- Flats, houses, etc. built with industrialized or traditional technology before 1994, which are subject to multiple change or modernization investments
- Flats, houses, etc. built with industrialized or traditional technology before 1994, which are subject to change from traditional energy sources to renewable energy sources. The supported activities are the followings:

- o Produce thermal energy with renewable energy sources, or electricity capacity establishment,
- o to raise biomass utilization,
- o to raise geothermal energy utilization,
- o to raise wind power utilization but not to electric network,
- o to raise organic waste energy utilization,
- o to raise active and passive solar energy utilization (e.g. establish thermal collectors, photovoltaic cells),
- o to establish alternative appliance, which is run with renewable energy, or which redeem the natural gas.
- o to establish heat pump,
- o to raise hydro power unitization.

It is possible that are municipal energy efficiency programmes as well but we have no information about them. (*Source: Energia Központ Kht.)*

15.2. Public supports for investments

Beside the above described National Energy Efficiency Programme there is no public support for investment, e.g. via tax deduction.
As a part of the National Energy Efficiency Programme the „ Successful Hungary” Energy Saving Credit Programme for People of Hungary offers bank loans at preferential conditions for energy efficiency measures and investments in renewable energy sources.
The people of Hungary can get two preferential bank loans for the renewable energy sources utilization: the first one is the subsidized loan, which is to cover the co financing of the National Energy Efficiency Program and the other one is a maximum 100 % credit for those who don't want or need the subsidy. Both of them could be claimed in the frame of the „Successful Hungary” Energy Saving Credit Program for People of Hungary , and supported by the Hungarian State, but commercial financial institutions do the loan outplacements, with the help of Energia Központ, which is the coordinator of this programme as well.
The overall available fund for financing the supported activities below is 16 billion Ft (6,5 million Euro)

The applicants:
- Hungarian citizen, or EU citizens, in case of a foreigner living at least one year in Hungary, and he/she is the owner of the house/flat which is the subject of the investment (referred hereafter as the natural person),
- In accordance with the 2004 annual CXV. directive, second paragraph, on cooperative flats
- In accordance with the 2003 annual CXXXIII. directive, third paragraph (first line), on apartment houses and the owners of the apartment houses. The cooperative flats and the apartment houses will be called hereafter residential community.

The aim of the loan:
1. Flats, houses, etc. built with industrialized or traditional technology before 1994, which are subject to change or modernization of heat isolation of windows/doors,
2. Flats, houses, etc. built with industrialized or traditional technology before 1994, which are subject to change or modernization investments of the existing heating and/or domestic hot water- supply appliances,
3. Flats, houses, etc. built with traditional technology before 1994, which are subject to change or modernization of isolation
4. Flats, houses, etc. built with industrialized or traditional technology before 1994, which are subject to multiple change or modernization investments
5. Flats, houses, etc. built with industrialized or traditional technology before 1994, which are subject to change from traditional energy sources to renewable energy sources: to establish

thermal energy, and electric energy with renewable energy sources or with biomass, geothermal energy, wind energy, and raising organic waste utilization, to establish solar thermal collectors, and photovoltaic cells.

Loan covering the co-financing of the community support for the investment:

- The natural persons or the residential community's loan can be 0-70% of the total investment cost to a maximum of 2.800.000 -Ft (approx. 11.200 Euro) per flats.

1. in case of 1st aim the maximum loan can be up to 1.408.000 Ft (approx. 5.600 Euro)
2. in case of 2nd aim the maximum loan can be up to 1.500.000 Ft (approx. 6.000 Euro)
3. in case of 3rd aim the maximum loan can be up to 1.500.000 Ft (approx. 6.000 Euro)
4. in case of 4th aim the maximum loan can be up to 2.800.000 Ft (approx. 11.000 Euro)
5. in case of 5th aim the maximum loan can be up to 2.800.000 Ft (approx. 11.000 Euro)

- 100% loan, without community support:
- The natural persons or the residential community's loan can be a maximum 4.000.000 -Ft (approx. 16.000 Euro) per flats.

There is no need to have one's own co-financing to get the preferential loan. The loan is based on the Ft (HUF) currency.

Conditions of the loan:

Table 7: Conditions of the Loan (Source: Energia Központ Kht)

Interest	For residential property: 3 month EURIBOR + maximum 2,5 %/year For natural persons: 12 month EURIBOR + maximum 2,5 %/year.
Credit application fee	Single fee, which can be maximum the 1 % of the loan amount.
Bank service charging	Doesn't charge this fee
Transfer's commission	Doesn't charge this fee
Contract modifying fee	Ad hoc fee, which extent and expiration is determined by the actual condition list of the financial credit institute.
Availability fee	Doesn't charge this fee
Prepayment fee	Doesn't charge this fee

Run of the term:

Table 8: Run of Term (Source: Energia Központ Kht)

Availability time	From contract signature to maximum 2 years.
Expiration	From contract signature at least 4 years, maximum 20 years.
Grace period	From contract signature to maximum 3 years. If the person has a home savings bank contract and uses his payments to repay the loan, then the loan expiration and grace period apply to the home savings bank contract but the grace period can't exceed 100 months.

The financial support is available until 31 December 2010. (*Source: Energia Központ Kht.)*

15.3. Third party financing

Third party financing is not available for inhabitants in Hungary. It is due to the fact that it would be too risky for private companies. There is no financial support for third party financing for inhabitants or companies. It is supported by public funds for institutions (municipalities, schools, hospitals, etc.)

15.4. Other incentives

As it was mentioned above it is possible that there are municipal energy efficiency programmes as well but we have no information about them.

15.5. Bank loan at preferential conditions

Beside the above mentioned “Successful Hungary” Energy Saving People of Hungary Credit Programme there are no bank loans at preferential conditions. The commercial banks offer normal personal bank loans which can be freely used but these are not at preferential conditions. These are normal bank loans.

D. Future Prospects

16. National energy policy

16.1. Brief description of the present and past energy policy and the role of solar thermal energy

The last debate on energy policy in Hungary was in 1993. Since then there have been many changes in the economy of Hungary which resulted as well in many changes to the energy industry of Hungary. In the last 15 years the energy intensity of industry has decreased, the pollution decreased, and the energy industry was privatized. Furthermore significant steps were done for the implementation of a liberalized energy market. On the other hand the country's dependence on fossil energy import has been constantly rising and there is a lot to do in the field of energy efficiency.
In the last 15 year the price of conventional fuels has been increasing and it is expected to be continue in the future as well.
Hungary is part of the EU and as a result it is compulsory for the country to adopt the common European legislation as well.

16.2. Priorities of the current general energy policy

According to the EU's prime ministers and presidents the EU (therefore Hungary as well) will face the following challenges [*Source: A 2007-2020 KÖZÖTTI IDŐSZAKRA VONATKOZÓ ENERGIAPOLITIKAI KONCEPCIÓRÓL SZÓLÓ, H/4858. SZÁMÚ ORSZÁGGYŰLÉSI HATÁROZAT, Magyarország megújuló energiaforrás felhasználás növelésének stratégiája 2007-2020*]:

- Decreasing dependency on energy import
- Very limited possibilities for diversification
- High and fluctuating energy prices
- Increasing worldwide energy needs
- Risk of security in the exploitation and transit countries
- Global warming
- Slow penetration of energy efficiency measures and renewable energy sources
- Beside the liberalization of the energy market its transparency is very limited

16.3. Energy mix of the country - share of renewable, share of solar thermal energy

As it was mentioned earlier Hungary's dependency on energy imports is high since the country has no oil and very limited coal and natural gas resources. The chart below introduces the energy mix of the country. It can be easily observed that the mostly used energy source is natural gas and oil but coal and primary electricity also important in the energy mix of Hungary. Unfortunately the share of renewables is very limited especially if it is considered that this includes the combustion of waste as well.

A few years ago the share of renewables was approx. 3,6% in Hungary but it has slightly increased to 4,1%. Regarding the share of solar thermal energy, there are no statistics about it and therefore it is hard to say anything. On the other hand it is estimated that the share of solar thermal energy is about 0,0072% of the total. It is basically insignificant.

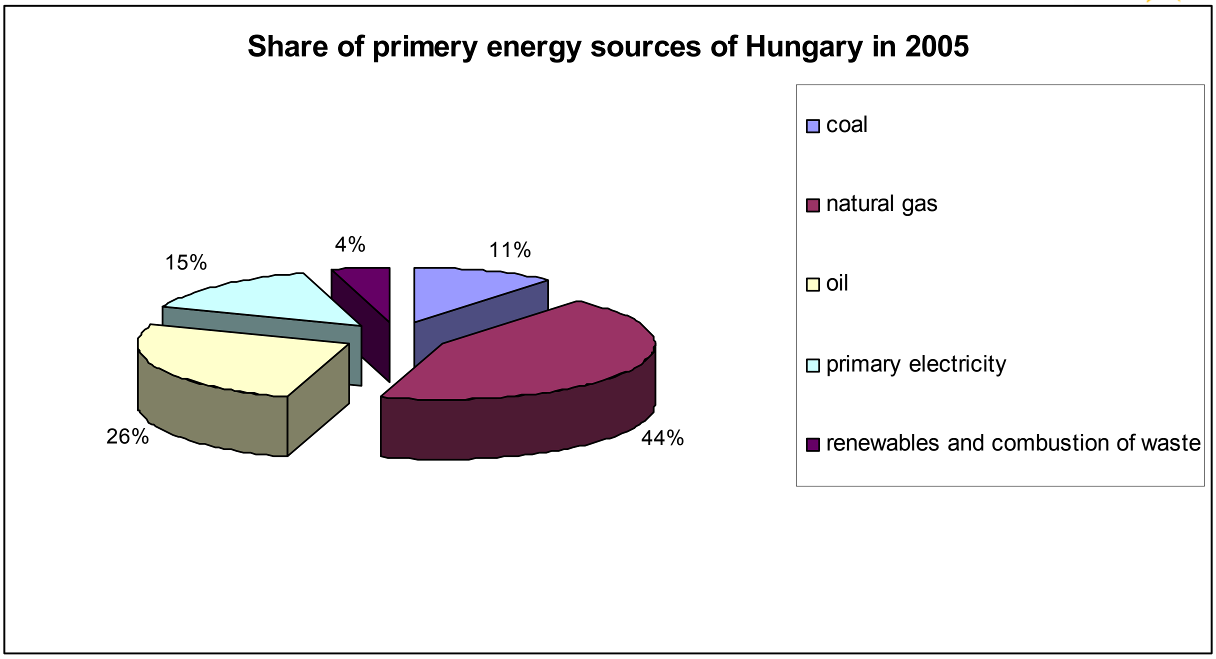

Figure 26: Share of Primary Energy Sources of Hungary in 2005 (Source: Magyarország megújuló energiaforrás felhasználás növelésének stratégiája 2007-2020)

16.4. Are there any targets to meet?

According to the green paper of the EU set in 1997 the EU has to increase the share of renewable energy sources to 12% as an overall average. A few years ago the share of renewables was approx. 3,6% in Hungary but it has slightly increased.

According to the new energy policy there are indicators which should be reached by 2015 or 2020. These are the followings:

Table 9: Renewable Energy Sources in 2020 and Energy Efficiency Measures until 2015 in Hungary (Source: Magyarország megújuló energiaforrás felhasználás növelésének stratégiája 2007-2020)

Renewable Energy Sources		
Item	**Unit**	**Deadline year 2020**
Total renewable energy sources	PJ	136-186
Electricity from renewable energy sources	GWh	7557-9470
Biofuels from biomass	PJ	19,6
Energy Efficiency		
Item	**Unit**	**Deadline year 2015**
Energy savings due to energy efficiency measures	PJ	54

The next chart shows the estimated total energy usage of Hungary in 2020:

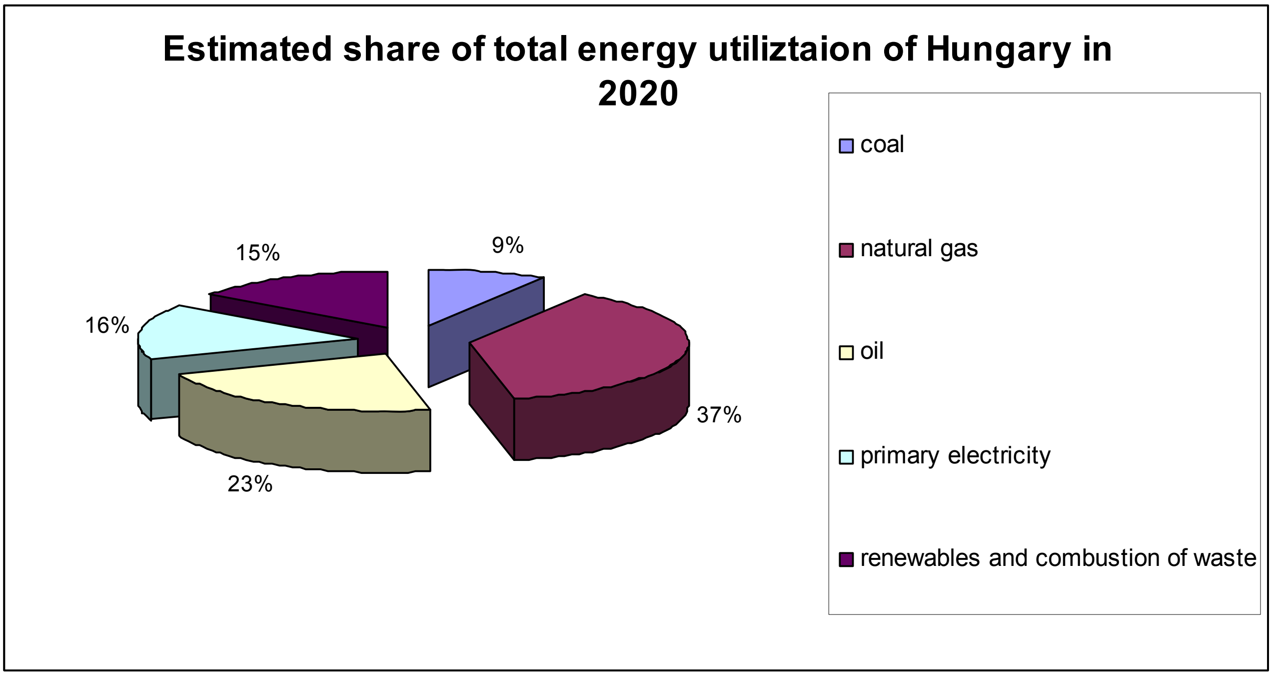

Figure 27: Estimated Share of Total Energy Utilization of Hungary in 2020 (Source: Magyarország megújuló energiaforrás felhasználás növelésének stratégiája 2007-2020)

16.5. Driving forces of energy policy

According to the new energy policy of Hungary the driving forces are the followings [*Source: A 2007-2020 KÖZÖTTI IDŐSZAKRA VONATKOZÓ ENERGIAPOLITIKAI KONCEPCIÓRÓL SZÓLÓ, H/4858. SZÁMÚ ORSZÁGGYŰLÉSI HATÁROZAT, Magyarország megújuló energiaforrás felhasználás növelésének stratégiája 2007-2020*]:

- Sustainability including energy efficiency measures and renewable energy sources
- Security of supply
- Sovereignty
- Common energy policy with the EU

17. Local bodies, prescribers, certification

17.1. Solar energy laboratories, tests centres: existing organisations with relevant addresses and contacts

The followings are test centres and certification centres:

- Építésügyi Minőségellenőrző Innovációs Kht. (ÉMI Kht) H-1113 Budapest, Diószegi út 37. Phone/Fax: +36 1 372 6115, www.emi.hu
- ÉMI-TÜV Bayern Kft. H-2000 Szentendre, Dózsa György út 26., Phone: +36-26/501-120, Fax: +36-26/501-150, www.tuv-bayern.hu
- BME (Budapest University of Technology and Economics) Építőanyag és Mérnökgeológiai Tanszék Laboratóriuma, H-1111 Budapest, Műegyetem rkp. 3-9., Phone: +36 1 463 1111, Fax: +36 1 463 1110, www.bme.hu
- Debreceni Egyedtem (University of Debrencen)

17.2. Solar energy certification

- MSZ EN 12975-1 (2006): Thermal solar systems and components - Solar collectors - Part 1: General Requirements. Date of adoption: 01.07.2006.
- MSZ EN 12975-2 (2006): Thermal solar systems and components - Solar collectors - Part 2: Test methods. Date of adoption: 01.07.2006.
- MSZ EN 12976-1 (2006): Thermal solar systems and components - Factory made systems - Part 1: General requirements. Date of adoption: 01.05.2006.
- MSZ EN 12976-2 (2006): Thermal solar systems and components - Factory made systems - Part 2: Test methods. Date of adoption: 01.05.2006.
- MSZ ENV 12977-1 (2001): Thermal solar systems and components - Custom built systems - Part 1: General requirements. Date of adoption: 01.10.2001.
- MSZ ENV 12977-2 (2001): Thermal solar systems and components - Custom built systems - Part 2: Test methods. Date of adoption: 01.10.2001.
- MSZ ENV 12977-3 (2001): Thermal solar systems and components - Custom built systems - Part 3: Performance characterisation of stores for solar heating systems. Date of adoption: 01.10.2001.
- MSZ EN ISO 9488 (1999): Solar energy - Vocabulary (ISO 9488: 1999). Date of adoption: 01.12.2000.

Further EN standards most likely are under adoption process.

These standards have been adopted by:
Magyar Szabványügyi Testület (Hungarian Standards Institution) H-1091 Budapest, Üllői út 25.; Phone: +36 1 456 6800; Fax: +36 1 456 6884, www.mszt.hu [*Source: Innoterm, ACCESS, Magyar Szabványügyi Testület, Magyar Mérnök Kamara]*

17.3. Solar association

The Magyar Napenergia Társaság (Hungarian Solar Energy Association) is an organisation whose aim is the wider utilization of solar energy. The president of the association is:

- Prof. Dr. László Imre, Budapesti Mûszaki és Gazdaságtudományi Egyetem, Energetikai Gépek és Rendszerek Tanszék, H-1111 Budapest, Mûegyetem rkp. 3-9.; Phone: +36 1 4633272, Fax: +36 1 463 3272, E-mail: imre@energia.bme.hu, http://fft.gau.hu/mnt/mnt/mnt.htm

17.4. Companies and manufacturers

See Annex A.

18. Objectives for the solar industry / market

Basically all of the large manufacturers present on the Hungarian market are slowly but surely becoming transparent; distributors, dealers, and installers providing misleading information are disappearing from the market.
Due to the fact that vast majority of the large manufacturers are present on the Hungarian market newcomers would have difficulties entering the market. They would have to provide lower prices and/or advanced technology to gain success in the market.
The National Energy Efficiency Programme (Nemzeti Energiahatékonysági Program) provides financial support for the implementation of solar thermal systems as well. This is expected to be continued in the future as well since it is a very important driving force of the wider penetration of solar thermal systems.

18.1. Prospects for market development by sector.

18.1.1. Domestic hot water production

As it was mentioned above this sector is the most common among customers. This is due to the relatively low payback period. It is expected that this sector would be the driving force of the solar market in Hungary in the following years as well. Contrary to the previous years the National Energy Efficiency Programme (Nemzeti Energiahatékonysági Program) currently provides a 30% financial contribution for the implementation of these systems, which seems to be sufficient. It has had a very positive effect on the market and it is expected that this positive effect would continue in the future as well.

18.1.2. Large collective solar systems

Large collector solar systems have also a great potential since the payback period is better than at family houses. On the other hand the owners usually cannot agree on the distribution of cost and/or don't have enough money to install the solar thermal system. It is important to note that, for dwellings, as soon as there is a solution for distributing the costs and providing adequate funds to this sector deployment could be speeded.

18.1.3. Space heating

Although the National Energy Efficiency Programme (Nemzeti Energiahatékonysági Program) currently provides about 30% financial contribution for the implementation thermal solar space heating systems these systems are not commonly used in Hungary due to the long payback period. It is expected that it would be slowly changing in the next years especially if the prices of conventional energy continue to increase substantially in the future.

18.1.4. District heating

District heating providers are usually rather big companies serving several hundreds or, in some cases, several thousands of flats. Smaller companies, like in Germany, do not exist in Hungary. The long payback period of solar thermal systems does not interest the district heating providers to purchase such systems. Solar thermal systems could be used only in spring and fall and these would cover only a small part of the district heating demand. As a result there is not any solar thermal system at district heating providers and it is very unlikely that it will change in the near future.

18.1.5. Air conditioning and industrial process heating

Air conditioning using conventional energy sources is currently increasing among the inhabitants of the country. Air conditioning systems based on solar thermal energy is not or only on a limitedly basis used by the inhabitants. The introduction of effective and low cost systems based on solar thermal energy would enhance the penetration of these environmentally friendly systems.
Concerning industrial cooling there is one demonstration project in Hungary which uses solar thermal energy for cooling at a department store. The installed solar thermal collector surface is about 1 000 m².
Regarding industrial process heating there is no information about it that exists in the country. It is due to the fact that its payback period is too long and the heat can be produced from other, cheaper energy sources. All in all there is no major change foreseen.

18.1.6. Unglazed collectors

Unglazed collectors represent a really small percentage of the current thermal solar market in Hungary and most likely it will remain the same. As a result no major change is expected in the near future.

The table below shows the prospects for 2010. Since there is no study about the prospects of the solar thermal market in Hungary for 2010 it is based on a yearly 30% increase. It seems to be a large yearly increase but the market of flat plate collectors increased around 50% yearly in the last two years, while the increase of vacuum collectors was between 66 and 250% yearly in the last three years. Large increases were seen in the unglazed collector market as well since the increase was between 35 and 88% yearly. It is important to mention that the yearly 30% increase is most likely possible if there would not be any negative change in the National Energy Efficiency Programme (Nemzeti Energiahatékonysági Program).

Table 10: Prospects 2010

	PROSPECTS 2010				
	Total Solar Collector Surface Area (m^2)	Solar collector productivity MWh/ m^2.year	Annual solar energy supply MWh	Total CO2 Emissions avoided tonnes/ year	Employment Number of permanent jobs
Domestic hot water production	121007	75024		22507	n/a
Large collective solar systems	15125	9378		2813	n/a
Space heating	7563	4689		1406	n/a
District heating	3781	2344		703	n/a
Air conditioning and industrial process heating	3781	2344		703	n/a
Unglazed collectors	2938	1821		547	n/a
Total	**154198**	**95602**		**28681**	n/a

As it was mentioned several times there are no statistics and studies about the prospect of solar thermal market in Hungary. Current market trends and sales are not predictable enough to project a decade into the future to 2020.

19. Strategy to overcome the barriers to market development

19.1. Description of major barriers by category:

19.1.1. Technical

- Existing projects are too simple; lacks of projects (inaccurate predictions as to the potential of systems and economics calculations, including the presumption of energy prices and the property contracts
- Inadequate education of installers. In some cases they have the best available technology but due to the lack of knowledge of the installers the system does not work properly; enhancing basic and professional education could help
- Risk of implementing new technologies
- Additional energy sources are still needed, especially at winter time

19.1.2. Institutional

- There is no complete database for RES, especially true for solar thermal sources
- There is no complete database about RES companies including solar thermal producers, resellers, dealers, and installers.
- Although the energy policy for 2007-2020 is accepted, the particular steps or action plan are missing from the document; therefore it is doubtful if the goals are going to be reached.
- Lack of transparency in the legislation
- There are some organizations and associations but their lobby power is low. It should be definitely enhanced.
- Administrative barriers – long-term processes are very difficult to get financial support for

19.1.3. Economic

- High investment cost, slow payback period
- Lack of financing but it is a good sign that the National Energy Efficiency Program support mechanism was changed. It is currently a good source for financing but could be developed further.
- Very long administrative process to get the financial support
- Long and difficult administration to get the EU donation
- Although the price of traditional energy sources has been rising, it is still too cheap, which limits the competitiveness of renewable energy sources.
- Traditional energy sources do not include the environmental or carbon emission tax. As a result the renewable energy sources are not competitive with traditional energy sources.
- There are a number of companies on the market which provide wrong economical calculations and affect customer trust and motivation negatively.

19.1.4. Cultural

- The people of Hungary are really price sensitive
- Lack of environmental consciousness
- RES are still not the common part of daily life (The usage of solar systems is not common for Hungarians as for other European countries; they are not use to trying new systems)

19.1.5. Educative

- Lack of knowledge among the people about estimations, calculation of real potential of a system, financing opportunities, payback period and benefits of renewable energy sources. Public sector and companies could help in this issue.
- Private companies interest is to inform the possible customer only about its system but no information is provided about other possibilities and opportunities.
- There is no special institution or educational establishment; only companies provide training but there is not independent training
- There are not enough experts nor adequate equipment. Many of the installers have never been educated to install solar systems. There are also problems with professional education as well. Professional education should be set up.
- There is very limited basic training; solar thermal issues are not part of it

19.1.6. Quality

- Low quality products appear on the market sometimes, which influences customer trust and motivation negatively.
- Renewables are a very limitedly part of education

19.2. Description of main measures (actions) needed to extend the solar thermal market by category

19.2.1. Technical

- Enhancing basic and professional education
- Providing wider reliable information about existing and new technologies

19.2.2. Institutional

- Setting up a complete database about RES, especially for solar thermal sources
- Setting up a complete database about RES companies including solar thermal producers, resellers, dealers, and installers
- Setting up an action plan for energy policy

- Enhancing organizations and associations' lobby power or setting up new and stronger organization and associations
- Shortening the processes to get financial support

19.2.3. Economic

- National Energy Efficiency Program support mechanism is sufficient but further development would help
- Shortening administration processes at the coordination agency (Energia Központ Kht.) to get the financial support
- Long and difficult administrative process to get the EU donation should be streamlined
- Implementation of carbon emission tax for the conventional energy sources
- Providing more reliable information for economics calculations

19.2.4. Cultural

- Providing more reliable information about environmental problems
- Providing more reliable information about RES

19.2.5. Educative

- The government could adjust the legislation to encourage wider utilization of renewable energy sources.
- Enhance knowledge among the people about estimations, calculation of real potential of a system, financing opportunities, payback period and benefits of renewable energy sources. Public sector and companies could help in this issue.
- Setting up special institution or educational establishment
- Professional education should be set up by associations. Currently bigger solar companies provide professional training for installers but it could be enhanced as well.
- Enhancing basic training
- Renewables could be integrated more into the school curriculum

19.2.6. Quality

- Quality certificate could be implemented by associations
- Renewables could be integrated more into the curriculum

19.3. Suggestions from key actors for contribution of the TRANS SOLAR project

19.3.1. Technical

- Enhancing basic and professional education by workshop
- Providing wider reliable information about existing and new technologies

19.3.2. Institutional

- Setting up a complete database about RES especially for solar thermal sources
- Setting up a complete database about RES companies, including solar thermal producers, resellers, dealers, and installers
- Enhancing organizations and associations' lobby power or setting up new, stronger organizations and associations

19.3.3. Economic

- Providing more reliable information about economical calculations

19.3.4. Cultural

- Providing more reliable information about environmental problems
- Providing more reliable information about RES

19.3.5. Educative

- Enhance knowledge among the people about estimations, calculation of real potential of a system, financing opportunities, payback period and benefits of renewable energy sources.
- Professional education should be set up by the associations. Currently bigger solar companies provide professional training for installers but it could be enhanced. The TRANS-SOLAR project could help.

19.3.6. Quality

- Quality certification could be implemented by associations. The TRANS-SOLAR project could help.

20. Concluding remarks

As it was mentioned earlier there are no statistics about the solar market in Hungary. As a result this report is based on Innoterm´s data collection. The data collection has started with a desk search using several relevant portal sites. As a next step a list of manufacturers, installers, resellers and dealers have been set up. Finally these organizations have been contacted firstly by email, secondly by phone. It means that the presented numbers of the Hungarian solar market are based on their supplied data. Last but not least this report gives a good overview on the Hungarian market even if it does not include each organisation.

The major producers are present on the market as well as consultancy companies and installers. Basically the training is also available for installers while the education in secondary school level could be developed.

All in all it can be stated that all elements, systems, and devices are available on the market; therefore, new companies are not really needed. Due to the fact that the vast majority of large manufacturers are present in the Hungarian market newcomers would have difficulties entering the market. They would have to provide lower prices and/or advanced technology to achieve success.

Information towards customers is also adequate and correct but further development is needed in this field since there are still some market actors providing misleading and/or false information about solar thermal systems.

Regarding the future of solar thermal market the National Energy Efficiency Programme (Nemzeti Energiahatékonysági Program) provides sufficient financial support for solar thermal systems and it has stimulated the market. Increasing the financial support would definitely enhance the penetration of solar thermal systems. Furthermore, the continuously increasing prices of conventional energy sources will have a positive effect on the market since the payback period of these systems would be shorter.

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Annex A: Solar Thermal Directory

List of firms producers, suppliers and installers of solar thermal systems in Hungary

No	Name	Address	Telephone/Fax	E-mail	website	Services	Origin of solar collectors:
1.	Buderus Kft.	H-2310 Szigetszentmiklós, Leshegy út 15	Phone: +36 24 525 200, Fax: +36 24 525 200	info@buderus.hu	www.buderus.hu		
2.	Vaillant Saunier Duval Kft.	H-1116 Budapest, Hunyadi J. út 1.	Telefon: +36 1 464 7800 Telefax: +36 1 464 7801	vaillant@vaillant.hu	www.vaillant.hu		
3.	Weishaupt Hőtechnikai Kft.	H-2051 Biatorbágy, Budai u.6.	Phone: +36 23 530 880 Fax: +36 23 530 881	info@weishaupt.hu	www.weishaupt.hu		
4.	Viessmann Fűtéstechnika Kft	H-2045, Törökbálint, Süssen u. 3.	Phone: +36 23 334 334, Fax: +36 23 334 339		www.viessmann.hu		
5.	Metall Glas Kft (member of Jullich Glas Holding)	Production: H-2840 Oroszlány, Mester út. 4. Sales: H-8000 Székesfehérvár, Holland Fasor 5.	Phone: +36 34 560 338, Fax: +36 34 560 339 Phone: +36 22 333 878, Fax: +36 22 511 566	machines@jullichglas.com	www.jullichglas.hu		
6.	Naplopó Kft	H-1033 Budapest, Szentendrei út 89-93.	Phone: +36 1 237 0433, Fax: +36 1 368 8676	naplopo@naplopo.hu	www.naplopo.hu		
7.	Márton Péter	n/a	Phone: +36 20 538 7705	peter@napra-kesz.hu	www.napra-kesz.hu		
8.	ZöldHázSolar KFT	H-1162, Budapest Csömöri út 255.	Phone:+36 1 405 0962, Fax:+36 1 405 4257	info@zoldhazsolar.hu	www.zoldhazsolar.hu	based on Danish technology but produced in Hungary	
9.	Soltec Kereskedelmi és Szolgáltató Kft.	H-1116 Budapest, Hunyadi J. u. 162 b/3	Phone: +36 1 204 9079; Fax: +36 1 204 5300	info@soltec.hu			
10.	LZ Thermotrade Kft,	H-2112 Veresegyház Szadai u. 13.	Phone: +36 28 588 810, Fax: +36 28 588 820	thermotrade@hoval.hu	www.hoval.hu		

No	Name	Address	Telephone/Fax	E-mail	website	Services	Origin of solar collectors:
11.	Merloni TermoSanitari Hungaria Kft,	H-1135 Budapest Hun u. 2.	Phone/Fax: +36 1 237 1110	info@aristonfutes.hu			
12.	SOLÁRTRADE Co. Kft	H-2151 Fót, József Attila u. 45	Phone: +36 27 537 492; Fax: +36 27 537 494	garaguly@solartrade.hu , solartrade@solartrade.hu	www.solartrade.hu		
13.	Pannon Solar Innovációs Kft	H-1147 Budapest Istvánffy u. 11/a	Phone: +36 1 221 7639; Mobile: +36 20 921 2188	ps@pannonsolar.hu	www.pannonsolar.hu		
14.	D-EG ZRT. DUNAFERR ÉPÜLETGÉPÉSZETI ZRT	H-2400, Dunaújváros Szilágyi Erzsébet u. Hrsz: 1566/52	Phone: +36 25 513 151, Fax: +36 25 282 374	deginfo1@degrt.hu	www.d-eg.hu		
15.	Bramac Kft	H-8200 Veszprém, Házgyári út 1	Phone: +6 88 590 883, Fax: +36 88 590 777	bramac.solar@bramac.com	www.bramac.hu		
16.	Kardos-Labor Kft	H-1172 Budapest, Rétifarkas u. 5.	Phone: +36 1 402 0478, Fax: +36 1 402 1738	info@kardoslabor.hu			
17.	Solár-Fort Kft	H-2011 Budakalász, Kékduna u. 3	Phone: +36 26 540 660, Fax: +36 26 540 662	info@solar-fort.com	www.solar-fort.com/hu/index.php		

Annex B: List of major legislative documents

- A 2007-2020 KÖZÖTTI IDŐSZAKRA VONATKOZÓ ENERGIAPOLITIKAI KONCEPCIÓRÓL SZÓLÓ, H/4858. SZÁMÚ ORSZÁGGYŰLÉSI HATÁROZAT
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