



## SO-PRO - Work Package 2

### D2.3 - REGIONAL REPORT ON THE SELECTION OF PRIORITY APPLICATIONS

#### The regional context

##### Short introduction of the region

The South Bohemian Region does not abound with mineral resources. The mining of gravel-sand, stone, brick clay, and, to a certain extent, ceramic clay, limestone and graphite prevails. The forests, which take up one third of the total area, form an important natural treasure.

The industrial production is concentrated particularly in, and around, the town of České Budějovice and in the districts of Tábor and Strakonice. The processing industry plays a significant role here, especially food and drink processing. Other important industries are production of vehicles, machinery and appliances, and also the textile and clothing industries.

The agricultural sector focuses on plant production, mostly on growing cereals, oil plants and potatoes. In animal husbandry, the breeding of cattle and pigs prevails. Fishpond cultivation has a long tradition in South Bohemia. Fish husbandry in the total area of 25 000 ha, makes up about 50% of the total production in the Czech Republic.

##### Current solar thermal market development

The most common type of solar collectors, that occur in the Czech Republic, are swimming pool mats (50 thousand m<sup>2</sup> in 2008), flat-plate atmospheric selective collectors (26,5 thous. m<sup>2</sup> in 2008), tubular solar collectors (8,5 thousand m<sup>2</sup> in 2008). Concentrating collectors form only an insignificant share on the Czech market.

On the solar market there is a big number of companies – importers, producers, selling and installation companies. The total number of companies that deal with solar thermal energy is about 1.200 in the whole Czech Republic (in South Bohemia there are about 80 companies). Solar collectors are offered by specialised companies, by common heating companies and suppliers of roofing materials. The innovation of 2008 was the offer of self-weighted and classical solar thermal collectors in hypermarkets with the goods for gadgeteers. In 2008 the offer of solar thermal collectors in internet shops increased intensely.

A significant facilitation of orientation on the solar market brought the List of Professional Suppliers (LPS) and the List of products and technologies of the subsidy programme „Green Light for Savings“ (Zelená úsporám), which introduce companies offering installation of solar collectors.

Solar thermal systems are largely installed by common heating companies and similar ones. It can be supposed that the number of registered companies will increase.

In the last 3 years the number of import companies has grown significantly. Since the 2nd half of 2007 an increasing number of trade companies importing Chinese vacuum tubular solar collectors occurs. It is both because of participation of Chinese producers on the international exhibitions and above all because of very favourable price of these collectors. On the other hand – a considerable part of „European“ tubular solar collectors come from China, or uses tubes of Chinese origin.

On the basis of statistical enquiry it is possible to specify the total surface of active glazed solar collectors at the end of the year 2008 to 165 thousand m<sup>2</sup>. There were installed approx. 220 thousand m<sup>2</sup> of glazed solar collectors with metal absorber from 1977 - 2008 in total. The supply of glazed solar collectors in 2008 was 35 thousand m<sup>2</sup> in total, the between-year growth makes therefore 40 %, which is more than in the previous year, when the market grew between years by 20 %. With regard to the above estimated surface of 165 thousand m<sup>2</sup> of glazed solar collectors their installed heat capacity is 115 MW<sub>t</sub> and their energy contribution was 202 TJ in 2008.

#### Existing solar process heat installations in the region

The only existing installation for utilization of the solar thermal energy in technological processes is in Cooperative Society Studená, which is a button factory in the district of Jinřichův Hradec.

Solar thermal systems are used here for preheating of warm water for washing and at the same time for water preheating for prewashing of buttons during the production. Currently 10 m<sup>3</sup> of water per day are heated with this system up to the temperature of 45 – 55 °C. Afterwards the water is heated by gas to the temperature of 60 °C. From the heated amount of water about 6 000 l is used for technological purposes and 4 000 l for washing.

Nevertheless the solar thermal system is obsolete. It has been used since 1985. In 1998 the system was modernised. Another renovation would be necessary but there is no money for it.

#### Costs for solar thermal installations (per m<sup>2</sup>, system costs for small-scale and larger-scale installations)

The costs for the installation of standard solar systems move around 15.000 – 20.000 CZK/m<sup>2</sup> (600 – 800 EUR/m<sup>2</sup>) for installations of smaller extent and 15.000 CZK/m<sup>2</sup> (600 EUR/m<sup>2</sup>) for installations of larger extent.

## Competing energy sources (incl. prices)

Energy source:	price CZK (EUR)/ MWh
- electricity (from the grid)	3750 (150) – price for small companies/ 2880 (115,2) – price for bigger companies
- light fuel oil	2100 (84)
- liquid gas	1500 (60)
- centralized supply of heat	1250 (44)
- natural gas	1300 (52) – price for small companies/ 930 (37,2) – price for bigger companies
- pellets	800 (32)
- coal	700 (28)
- wood chips	480 (19)
- lump wood	450 (18)

The energy sources are lined up in the descending order according to the price for energy unit.

As competing energy source can be also seen waste heat.

### (Financial) support programmes which could be used for So-Pro projects (solar thermal subsidies, other support mechanisms, e.g. for pilot projects)

The only programme that could be used for the So-Pro projects is the Operational Programme Enterprise and Innovation 2007–2013 (OPEI) of the Ministry of Industry and Trade of the Czech Republic at the moment (end of March 2010).

The Ministry of Industry and Trade launched a programme of support of small and medium—sized enterprises (hereinafter SMEs) ECO-ENERGY in the form of a round, but time limited third call for proposals on 1 February 2010.

The intake of electronic registration forms started on 1 March 2010. The deadline for the submission of electronic applications will be on 30 June 2010.

The programme ECO-ENERGY is part of the Operational Programme Enterprise and Innovation and is focused particularly on increasing the effectiveness of generation, transmission and consumption of energy and the use of renewable and alternative energy sources.

In the opened call, besides other activities, also the activity „the increase of energy efficiency of the production and technological processes“ is supported, i.e. there is no specific formulation concerning solar process heat, but it could be a part of the supported activities.

Currently there is no actual call for proposals within the other support programmes (e.g. Operational Programme Environment 2007 – 2013 or Programme Effect).

## Industrial sectors of special interest in the region

The South Bohemian economy is largely based on the utilization of local sources of raw materials, which contributed to the development of wood-processing, paper-making, glass-making, ceramic and building materials industries. The textile industry and the production of pencils were also of importance. The food industry processing products of local agriculture established itself markedly (brewery, milk and meat industries). Currently the most important branches according to the added value are manufacturing industry (mostly food and drink production, production of vehicles and traffic facilities), trade; repairing of vehicles and products for personal need – predominantly for household and activities in the area of real estate and lease; business activities.

That's why the main relevant sectors seem: manufacturing industry, textile industry, brewery and milk and meat industries.

*Basic indicators of the industry: Czech Republic/South Bohemia 2008 (enterprises with 100 employees or more with head office in the region)*

	Average number of enterprises	Sales of own goods and services incidental to industry (current prices)			Average registered number of employees (actual persons)	Average monthly gross wages per employee (CZK)
		Total (CZK million)	Sales of direct export (%)	Per employee (CZK thousand)		
<b>Czech Republic</b>	<b>2 585</b>	<b>2 804 780</b>	<b>49,4</b>	<b>3 067</b>	<b>914 564</b>	<b>23 598</b>
<b>South Bohemian region</b>	<b>170</b>	<b>128 973</b>	<b>47,8</b>	<b>2 437</b>	<b>52 918</b>	<b>22 058</b>

	Average number of enterprises: by CZ-NACE (Enterprises with 100 or more employees with head office in the region)
<i>CZ-NACE</i>	2008
<b>Industry, total</b>	<b>170</b>
<b>Manufacturing</b>	<b>161</b>
<i>Manufacture of food products, beverages and tobacco</i>	22
<i>Manufacture of textiles and textile products</i>	9
<i>Manufacture of wood and wood products</i>	7
<i>Manufacture of pulp, paper and paper products, publishing and printing</i>	6
<i>Manufacture of rubber and plastic products</i>	15
<i>Manufacture of other non-metallic mineral products</i>	7
<i>Manufacture of basic metals and fabricated metal products</i>	21

<i>Manufacture of machinery and equipment n.e.c.</i>	24
<i>Manufacture of electrical and optical equipment</i>	24
<i>Manufacture of transport equipment</i>	12
<i>Manufacturing n.e.c.</i>	11
<b><i>Electricity, gas and water supply</i></b>	<b>7</b>

## Main stakeholders

### *Important suppliers of solar systems in the South-Bohemian region*

[Envi s.r.o.](http://www.envi.cz) Dukelská 145, 379 82 Třeboň +420 384 706 111 [www.envi.cz](http://www.envi.cz)

[JH SOLAR s.r.o.](http://www.jhsolar.cz) Plavsko 88, 378 02 Plavsko +420 384 390 967 [www.jhsolar.cz](http://www.jhsolar.cz)

### *Important public bodies (not only) in the South Bohemian region:*

South Bohemian Region: Department of regional development – Ing. Luboš Průcha  
 South Bohemian Chamber of Commerce: Ing. Jiří Stráský  
 Department of Environmental Engineering, Faculty of Mechanical Engineering, Czech Technical University in Prague

## Regional approach to companies for screening and for pilot projects

First of all industrial companies that made use of energy consultancy of ECCB in the past have been addressed. The first step was addressing a person who is responsible for the energetics of the company per telephone. In case of smaller companies we spoke directly to the owner of the company. The European project So-Pro was shortly introduced per telephone. There is a positive experience from the previous personal contacts with the persons involved and from the previous cooperation.

As the next step, over 500 industrial companies were addressed with a letter where we offered them a free energy screening. Approx. 10 companies reacted to this letter and were interested in the energy screening. Nevertheless the interest was not so big, as we assumed, that is why we had to contact some companies also by telephone.

## **Results from the screenings and reasons for the selection of priority applications**

An important factor for the choice of the company, where the energy screening should/was supposed to be done, was to overcome the initial scepticism that was to be felt at the first telephone contact. There are a lot of companies offering various goods and services or carrying out a market survey per telephone in the Czech Republic. That is why it was made use of personal contacts eventually of the knowledge of the milieu in the selected companies in the beginning.

The good reputation of Energy Centre České Budějovice (ECCB) and its employees contributed decisively in the gaining of confidence and compliance for implementing the screenings. Persons at the managerial posts or at the posts of power-supply directors of bigger companies often had positive personal experience with energy consultancy of Energy Centre České Budějovice. They often operated their private solar thermal or PV systems, so they knew this topic well. On the contrary with the smaller companies it was sometimes the first closer contact with this theme. It led several times to misunderstanding – after the arrival of the employees of ECCB the employees learnt sometimes that the owner thought the energy screening should deal with PV systems, not with solar thermal systems. Nevertheless the employees managed to find a technology where solar process heat could be used in also in these cases.

A short explaining letter with the description of So-Pro project was sent to chosen companies (522). Several companies reacted to this letter and were interested in implementing the energy screening. All these companies were visited afterwards.

The biggest companies in the region of the food-processing and machinery industries were addressed primarily – however without the expected response from the side of the companies.

Other addressed companies (not only with the letter but afterwards also per telephone) refused the implementing of the energy screening most often because of the lack of financial resources (uncertainty of contracts, financial crisis), lack of competence to make decisions of this type or because of abundance of waste heat.

If we shall summarize the results of the screenings, we can say that almost in all cases one process was found where solar thermal could be used – i.e. hot water preparation – however the water would be determined for washing and showering of employees of the companies.

The main results of the screenings according to the number of processes are mentioned in the following table:

Hot water preparation.....	7
Heating of baths.....	4
Washing of technology.....	3
Feedwater pre-heating.....	2
Drying.....	1*
Heating of halls.....	1*

The cases marked with \* mean an original request of a company that however could not be implemented after the inspection of the local conditions in the company.

In comparison with the original expectations there were more cases of feedwater pre-heating than of drying. With regard to the low absolute value of the numbers no definite conclusions can be drawn for the future.

When choosing the companies for carrying out the screenings, there was always the effort to map as many production processes as possible and also to map more places in the region.



The following table shows the overview of visited plants according to the type of production, some plants involve more production types.

Machinery – metal working industry.....	7
Surface treatment.....	4
Food-processing industry.....	4
Electrical industry.....	2
Services.....	2
Paper-making industry.....	1
Textile industry.....	1

At the first design of each system only indicators were used. If the system shall serve mostly for the hot water preparation, the yearly solar coverage of the heat demand for this purpose in the amount of 60 % was considered. It means, that approx. from April to August the heat demand for the hot water preparation is theoretically covered only with the solar system and in summer there is a small amount of excess heat.

The abundance of waste heat in companies can be considered as a big obstacle for a bigger expansion of solar thermal installations. It is logical to concentrate on its utilization before making other arrangements. It is mostly heat from cooling of steam condensate, heat from baking ovens, heat from condensators of machine cooling and heat from cooling of compressors. It is already intensively used in many plants mostly for pre-heating of hot water and for heating. In other plants, where the waste heat is not used yet, projects for its utilization are prepared.

In case of the interest to carry out the proposed solar thermal system the second and more detailed approach in form of a project and more detailed calculations would follow this preliminary design, that is the output of the screening. The more detailed project would include concrete climate conditions in the site of installation and optimization of the particular components of the system, type of collectors, their inclination etc.

When sizing the system intended solely for a particular technological process, where the economic payback period is always assessed strictly, the system must be sized in the way so that all the heat production produced by solar installation is consumed. In practice, this means about 50% coverage of the annual heat demand. Nevertheless the desired economic return of 3 to 4 years can not be achieved. The „simple economic return“ is several times higher than the above mentioned values. This is caused by the ratio between the price of the system and energy prices - the wholesale customers are able to negotiate favourable prices with distribution companies.

A frequent question that is always asked is the question concerning the possibility of financial subsidies for the implementation of the system. When considering the prices for the installation it is the only way how to reach the acceptable economic return. From interviews with the employees of the enterprises it is evident that they expect (after the free screenings) the possibility of subsidies from the side of EU for the implementation of their intentions.

In the Czech Republic the installation of solar thermal systems for family houses and apartment buildings is currently systematically supported by the subsidy programme „Green Light for Savings“ of the Ministry of Environment, respectively of the State Environmental Fund. Money for this programme was obtained from the sale of CO<sub>2</sub> emission credits under the rules of the Kyoto Protocol. The emissions savings, which allowed this trade, were mainly gained due to the industrial companies where there has been a reduction in emissions by improving the quality of production processes, possibly by reducing of the production. The subsidy programme „Green Light for Savings“ is determined not only for the subvention of solar thermal systems, but also of heat pumps and low emission biomass boilers and above all for the subvention of thermal insulation of buildings.

The total expected allocation of the programme is up to 25 billion CZK (1 billion EUR). Currently the CO<sub>2</sub> emission credits for 16 billion CZK have been sold and 1 billion CZK has been made use of. The duration of the subsidy programme is till the end of 2012. If the whole amount of financial resources is not made use of by that time, the rest of it will have to be returned.

At present there is no state subsidy programme for the subvention of solar thermal installation in industry. The only possibility where solar thermal heat in the industry could be subsidized is within the Operational Programme Enterprise and Innovation operated by the Ministry of Industry and Trade of the Czech Republic. In the opened call, besides other activities, also the activity „the increase of energy efficiency of the production and technological processes“ is supported, i.e. there is no specific formulation concerning solar process heat, but it could be a part of the supported activities.

If we return to the results of screenings, there would be some more remarks. A lot of industrial companies use steam for technological processes. In big companies it is used for the combined production of heat and electrical energy; they provide steam also to their neighbourhood. Smaller companies working with steam as a heat carrier produce it either on their own mostly on basis of gas boilers or take it from central source, e.g. from the municipal heating plant. In the last mentioned case cooling of condensate is especially important.

The importance of pre-heating of fresh feed water for boilers grows if steam is produced for the own use in the company and if the condensate return is small.

The companies are aware of the fact that steam economy causes big heat losses and that is why they try to substitute steam by other media, if possible. It is valid especially for heating – steam systems have been substituted by warm water systems and steam heatings of technological equipment have been substituted by direct heating (natural gas).

A lot of thermal equipments in companies come from the 1970's and 1980's. It corresponds to the condition of thermal insulation, control elements and other components. Although these equipments have been continuously maintained and old elements have been substituted by new ones, they mostly need capital repair or radical change. In these cases it is necessary to look for the basis of savings in these changes and at the same time when reconstructing it is possible to integrate solar thermal system to the existing one.

An influence of automotive industry is to be seen in the companies. Traditional suppliers of special products of the textile and metal working industries became subsupplier of the automotive industry.

As mentioned above, the main factor for decision making on solar thermal installation is the predicted payback period. Depending on the energy price and its type – steam, natural gas, electricity the simple payback period is calculated for 12 – 50 years. That is why it is necessary to include the supposed growth of prices of original energies into the calculation. A planner of such a system who shall calculate the real payback period has to take note of the growth of prices – the question that cannot be exactly answered neither by leading politicians nor by economists.

The companies have been founded as trading companies – most often as incorporated companies or limited liability companies - for the purpose of the profit. It is clear that they prefer investments into the renovation of technological equipment where the repayment time is several years. Reasonably short payback period is also required by banks when providing a credit.

The even worse situation is in small towns and in the country. Formerly flourishing small companies with long tradition have lost their customers from Eastern Europe. Not successful privatizations and change of owners contributed to this situation as well. The companies have sacked their employees who hardly find another job. It is not worth to travel to work from the remote places to bigger towns (if there are any job opportunities at all). That is why people prefer staying at home and living from the unemployment benefits. In these cases that are unfortunately quite often any questionnaire (even well prepared) concerning the conditions for installation of solar thermal system cannot meet a big interest of the company's owner.

## Outlook

After summerising the screenings' results we can say there is a correspondence between the occurrence of particular priority applications and the found out reality. On the basis of concrete results of the screenings and the knowledge of the operations of the companies in the region where screenings were made we can specify the order of the expected technological processes suitable for the utilization of solar thermal heat as follows:

1. hot water preparation for both washing the employees and for technological processes in general, water is not determined for one process
2. preheating of feedwater (e.g. for steam boilers) or for the fillings of a technological equipment (boiling tank) where water heating has to be finished in the technological equipment with another heat source
3. heating of baths.

The characteristics of the first group are as follows: open secondary circuit, hot water is consumed – it does not return, it is being heated from the low inlet temperature. The system is simple – when designing the system only indicators can be applied. Theoretically it is possible to cover the heat demand with it in summer months without the need of any other

standard source. In summer there is necessarily excess heat. Flat solar collectors and storage tank heaters with inbuilt heat exchangers are sufficient for the functioning of the system.

The second group can be characterized with the continuous heat consumption. Smaller ratio between the collectors' surface and the volume of water storage tank is sufficient. Fresh water of the low inlet temperature is being heated, that is why the efficiency of the system is quite high. With regard to the high outputs it is necessary to use the external exchangers. There is no excess heat in summer.

The third group is characterized with the closed secondary circuit where the heat carrier of constantly higher temperature and of small temperature gradient circulates. Such a system needs a large ratio between the buffer storage and collectors' surface. It is necessary to use at least the evacuated flat-plate solar thermal collectors. Bigger attention should be paid to the design of the system with regard to the local weather conditions.

In comparison to the original expectations and on the basis of the screenings' results we prefer the priority application heating of feedwater to drying. The reason for it is both smaller occurrence, need of higher temperature and the fact, that the existing system works with steam or electricity, where the integration of a low temperature source would be difficult which practically means the reconstruction of the existing system. When reconstructing a technically old system it is possible to think of the utilization of a low temperature heat carrier from the very beginning and adapt the new system to it already in its design. It is valid also for the other areas.

Owing to the long simple payback periods of solar thermal systems without any support in form of subsidies and advantageous energy prices in the companies some basic rules should be adhered to:

1. Right choice of technological process for the utilization of solar thermal heat
2. Right sizing of the system, elaboration the project documentation by an experienced company
3. Implementing the system installation by a well-established installation company using high-quality materials
4. good operating of the solar system

When not adhering to any of the points mentioned above it can depreciate the other points or also the total effect of the system.

Legislation is also important. As already mentioned in the regional inventory it is necessary to consider the possibility of creation of a new subsidy programme within the EU to support installation for solar thermal heat. The companies are interested in solving their energy situation. That is why it is necessary to make use of it and create a stable and long-term subsidy programme that specialists would get used to and that would gradually become a common part of the utilization process of solar thermal heat in the industry. It would have a positive influence on the market and its actors.

In light of these facts the previous totalitarian regime paradoxically seems to be better at supporting the development of solar thermal systems in the industry by central management, commands of the party and pricing in a certain period. In many cases, however, the overall effect was devalued by a formal approach to such tasks. Nowadays, when all production is in private hands, the support in a form of subsidies is one of the only state instruments, how to direct and encourage the development.