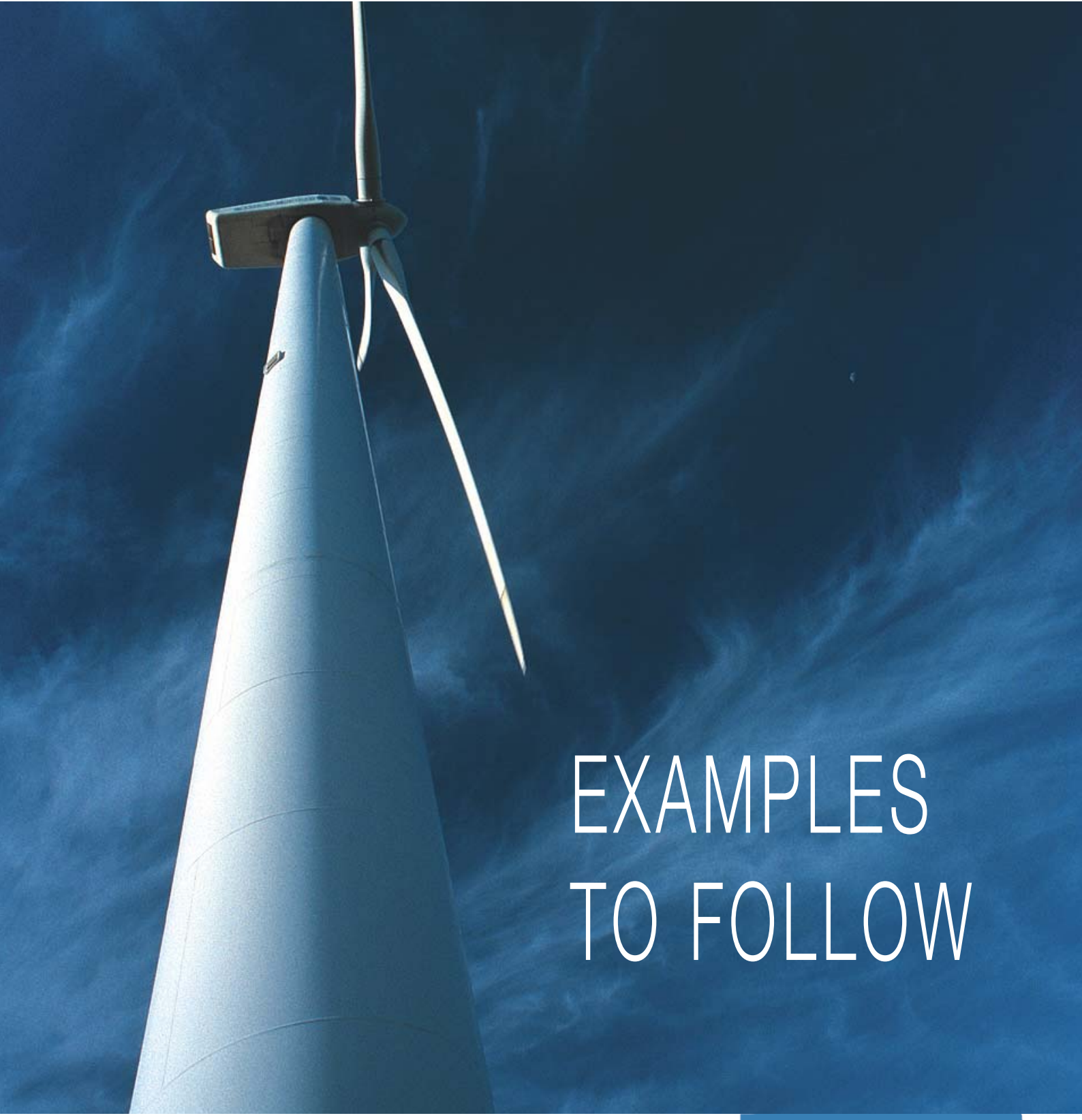

# EXAMPLES TO FOLLOW

## Successful
# Renewable Energy
## Investments from the Visegrád Group Countries

ENERGIA KLUB
KÖRNYEZETVÉDELMI EGYESÜLET

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# INTRODUCTION

Examples to follow. The 15 cases presented in our publication are all taken as examples from the four countries of the Visegrád Group and such successful renewable energy investments are shown which are considered inspiring examples to be followed by governments, municipalities, smaller communities and companies, as well.

It is common knowledge that in Western Europe solar energy, wind power, biomass or geothermal power are widely known and used in many countries. The significance of the use of renewable energy sources has been understood by many in our region, too; however, the substantial majority has merely heard about it.

It was considered worthwhile to have a look around our own practices since an increasing number of positive initiatives can be observed in Hungary, as well as investments which are completed or setting examples. Four investments have been selected for presentation from each of the four Visegrád countries; in this work our partners have been the Polish Ecological Club, the Czech Hnutí Duha environmental association, and the Ekopolis from Slovakia. When selecting certain investments, the common aspect taken into consideration has been that all these projects should comply with fundamental environmental protection and nature conservation requirements as well as environmental sustainability. Moreover, these completed projects must be of small scale, of local significance (<10MW) and running for at least one year. Another question to be answered was how many new workplaces have been created as the result of concerned investments and how local residents were involved during the work. In the Visegrád Four countries similar economic, social, political and environmental circumstances prevail; therefore, experience gained in one country can prove valuable for others.

Four special cases are highlighted in detail in this collection and a further eleven are summarized briefly though their full-length version is available at www.energiaklub.hu, and www.agreenet.info

This publication will hopefully serve as the starting point of a continuously expanding Internet database which would contain renewable energy projects from all over the region which could set an example; i.e. the experience gained so far will be shared with the general public. So if you know about a similar investment, please visit our website and inform us about it.

Our publication bears the title "Examples to Follow" because we sincerely hope that more and more decision-makers in the countries of this region will realize and seize the chance and opportunities in renewable energy sources. In our opinion, such investments by smaller and larger communities make life more liveable for residents, they protect nature while, with their own tools and equipment, contributing to the reduction of Green House Gase (GHG) emissions, e.g. $CO_2$ causing global climate change.

Budapest, 11th December 2006.

Editors:
Zsolt Kazai and Katalin Varga

# Supporting Renewable Energy Projects in the Visegrád Four Countries

It is well-known that the four Visegrád countries joining the European Union in 2004 must observe rules and regulations already approved by the European Community. Promoting and supporting the use of renewable energy sources were declared political targets and designed regulations for the new member states. In accordance with these targets and rules, all member states had to set community targets and had to define commitments necessary to be fulfilled by 2010. During this procedure, the European Commission simply develops the guidelines and determines the target to achieve, but it is the task of the member states to establish some support policy for meeting their commitments. The European Commission sincerely hopes that the experience thus gained shall facilitate the development of a clear and coherent support policy adoptable in all member states. Member states had to compile their latest reports by the end of 2005 concerning the means of enforcing EU standards in their national legislation and results that can be demonstrated. Based on the above, a brief summary is provided as for the major characteristics of the currently existing regulatory and supporting environment.

## THE CZECH REPUBLIC

The regulatory structure of the Czech Republic is unique not only among the Visegrád countries but, in a way, also among the member states of the European Union. This is so since the Czech legislation already passed the Act of Renewable Energy in 2004 coming into force on 1st August 2005. Therefore, similarly to Austria and Germany, it became the only Visegrád Four country where a separate act regulates the production and use of renewable energy. The other special aspect of regulation is that the two schemes with the most widespread support in the European Union, namely the feed-in obligation and Green Certificate are applied in parallel. It means that the generator recovering renewable energy can decide whether it would like to receive a special feed-in price for the generated energy or a so-called Green Certificate having commercial value and already introduced in Poland, as well. Feed-in prices are differentiated according to technology, similarly to Slovakia, and the highest price is paid for the electricity produced by solar power. Furthermore, it is set in the relevant Act that a 15-year payback period must be guaranteed in the case of renewable energy investments. This provides security for investors and easier access to bank loans.

Pursuant to the EU Directive, the Czech Republic took on the commitment of reaching a minimum of 8% of renewable energy sources concerning total electricity use by 2010.

Currently, hydraulic power constitutes the largest part of electricity produced from renewable energy sources (in 2004 nearly 76%) followed by biomass as the second most substantial part. In order to reduce residential and community energy use and at the same time promote technologies adopting renewable energy sources, additional programs have been launched. Needless to say, similarly to other countries, EU Structural Funds are also heavily relied upon in the Czech Republic.

## POLAND

The principal target set by Poland is to reach at least 7.5% of the total electricity consumption originating from various renewable energy sources by 2010. Taking this target into consideration, decision makers consider cost efficiency and energy prices of utmost importance. Furthermore, such renewable energy sources would be exploited whose connected technology is already wholly developed and which are adoptable without extra support. It is also mentioned separately in the strategy that a decrease in the use of renewable energy is not desired in case it leads to an unjustified rise in consumer prices.

The rules and regulations concerning the exploitation of renewable energy sources belong under the Energy Act. Polish legislation voted the Green Certificate system in April 2005. Consequently, the generator recovering renewable energy does not receive a previously defined price for the produced renewable energy but receives, in return for a certificate of designation of origin, a certificate with commercial value which can be sold in the internal energy market. According to the Polish government, this system enhances the spread of the most efficient production schemes and, at the same time, due to fixed acceptance prices, does not guarantee an unjustifiably high amount of support.
In addition, a variety of loans with preferential terms and state subsidies are available for launching this type of investment project.

Fundamental strategic targets have been set for Polish energy policy till 2020. Based on these targets, the most significant part is planned to be played by biomass, as well as wind and hydraulic power. These areas also receive the largest sums of support. As for solar power, similarly to geothermal energy, it would take a more substantial part in heat production. In terms of geothermal power, the possibility of connected energy production has also been considered; however, further research is required in this field. It is Poland's strategic objective to reach a rate 14% in renewable energy use of the total electricity consumption by 2020. Currently, the highest rate within renewable energy sources is represented by hydraulic power. Nevertheless, this figure means that two-thirds of the total installed capacity of hydroelectric power plants is composed of units larger than 10 MW. The share of biomass and, in particular, biogas (22 MW in 2004) and wind power plants (65 MW in 2004) is also dynamically increasing.

## HUNGARY

In comparison with other countries in the Visegrád Four, the situation of Hungary is unique from two aspects. On the one hand, this is where the level of obligatory commitment in line with the objectives of the European Union is the lowest of the four countries. On the other hand, this is the country where the targeted value was not only reached but exceeded as early as in 2005. The two are obviously related. Hungary committed that 3.6% of the total electricity consumption will originate from renewable energy sources by 2010. In 2005 this rate reached 4.17%. The process is taking place thanks to the increasing use of biomass and, in particular, the heating of wood-chips in large power plants starting in 2004. This provides nearly 90% of electricity generated from renewable energy sources but unfortunately it is characterized by the lack of combined heat and power (CHP) production and centralization.

In Hungary, electricity production with the exploitation of renewable energy sources is regulated by Act CX of 2001 on electricity (hereafter referred to as the Electricity Act). The Electricity Act coming into force in 2001 and amended significantly several times since, contains the regulation concerning the feed-in obligation of green power. According to this rule, the public utility electricity provider is obliged to take over the electricity generated from renewable energy sources at a higher price than the market price. The difference between market price and obligatory acceptance price is financed from separate reserves of income fee within the system use fee. This item is built in the costs of each and every consumer and system user. This system is currently being reorganized since from July 2007 regarding to the market liberalization. Now it is doubtful who shall take over the generated electricity.

The existing system is based upon fixed-priced obligatory takeover; however, since 2005, following significant modifications, the system has been rather mixed. Since September 2005 the Electricity Act differentiates between weather-dependent (sun, wind) and weather-independent (biomass, water, geothermal) renewable energy sources. The same acceptance price is paid at all times for the energy generated by means of the former ones, whilst for the latter, there is a difference between the acceptance prices depending on the peak and off-peak periods of the total consumption.
Acceptance prices have been determined in the Electricity Act in 2005 with the one condition that its value may increase at the rate of annual inflation. Previously the acceptance pricec had been legislated in ministry orders.

Simultaneously, a special situation arose in 2005 in terms of wind power since the upper limit of national capacity was imposed at 330 MW. The capacity in 2005 reached 17.5 MW but permission was requested for an additional 1,138 MW. With reference to the stability of the electricity system, from the spring of 2006 no permit may be obtained for wind power stations generating electricity for the network. This situation is not expected to change until 2010.

## SLOVAKIA

The Slovakian legislation adopted new regulations in 2004 in order to fully comply with the Directive 2001/77/EC. This Directive obliges member states of the EU to take the necessary measures in order to promote the use of electricity produced from renewable energy source. The major element of Slovakian legislation is the takeover of electricity generated with the use of renewable energy source at a special acceptance price and promoting its feeding in the network and enhancing its distribution. Energy production from renewable energy sources is regulated by the Energy Act. This Act provides the clear definition of renewable energy, lays down the terms and conditions of connecting to distribution-supply network, and assigns responsibilities for generators, system operators and energy suppliers. Electricity suppliers are obliged to disclose information concerning the origin of energy used and supplied by the supplier, i.e. concerning the proportion of various primary energy sources used to generate the relevant energy. The Act also contains the regulation that generators below 5 MW of renewable energy belong under a simplified authorization procedure.

The acceptance price of electricity produced with the use of renewable energy sources is defined in a separate regulation. Acceptance prices are differentiated by technologies; i.e. a different price is set in the event of using hydraulic, biomass, wind, solar or geothermal power. In the case of certain technologies prices vary in accordance with different MWh,; therefore, in terms of hydraulic and wind power stations the time of starting the operation serves as the basis, while in case of biomass it is the applied technology that counts. Acceptance prices range from 1,900 and 8,000 Slovak koruna according to technology. The highest value in 2006 was received by solar energy. Acceptance prices increase annually in line with the rate of inflation.

In addition to the above, further state subsidies can be granted via tenders for the purchasing of renewable energy and cogeneration technologies. However, in case EU resources are also mobilized for such means, electricity generators receive 15% lower acceptance price for the produced electricity than the price defined in the above piece of legislation.

Slovakia - pursuant to the 2010 objectives of the EU - has made a commitment to a 31% proportion of renewable energy in electricity. Currently this figure seems much too ambitious and at the moment it is doubtful that the country will be able to reach this target. So far half of the target has already been achieved (at 14.4% in 2004). Today the real perspective is provided by biomass, wind and hydraulic power in Slovakia.

Further information:
http://ec.europa.eu/energy/res/legislation/electricity_member_states_en.htm

In the following section inspiring examples of investments from the Visegrád Group are presented.

# CZECH REPUBLIC → JINDŘICHOVICE

## RENEWABLE TECHNOLOGIES IN JINDŘICHOVICE POD SMRKEM


| | | |
|---|---|---|
| **Place of investment**<br>Czech Republic,<br>Liberec region | **Installed capacity (kW/MW)**<br>150+200 kWth (biomass heaters) | **Project cost (gross)**<br>EUR 105 000 (3.5m CZK)<br>(biomass heaters) |
| **Start of operation**<br>2002 | **Number of users of generated energy**<br>Five municipal buildings (around 150 people) | **Type of replaced energy resource)**<br>Coal |
| **Project type**<br>Communal | **Financial support**<br>60 percent commercial loan | |
| **Owner**<br>Municipality of<br>Jindřichovice<br>pod Smrkem | **Investor**<br>Municipality of Jindřichovice pod Smrkem | |
| | **Contractor**<br>The project was developed by the village and microregion's administration, the technology and the related services were delivered by several private companies | |

## THE PROJECT

The municipality of Jindřichovice pod Smrkem contributes with several projects to the energy self-sufficiency strategy of the surrounding microregion, which strategy was adopted in 1999. The personality of the village mayor is the main driving force behind the developments, and he plays a significant role in promoting renewable and decentralized energy sources.

One of these projects was the investment in two biomass heaters with a combined capacity of 350 kWth. They replaced coal-fired boilers during an overall reconstruction of the heat-supply system. Heat from burning wooden chips is supplied for five communal buildings. Next to the significantly reduced air pollution, the project also brings economic benefits to the village and provides employment for over 15 seasonal workers. A wind farm - also constructed in line with the energy self-sufficiency strategy - consisting of two wind generators of 600 kW capacity each, brings an annual net income exceeding EUR 30 000 to the budget of the remote village with about 600 inhabitants. Next to one of the wind mills, a wooden low-energy house accommodates a tourist information centre which attracts over 10 000 visitors each year. The biomass heaters were put into operation in 2002, the wind turbines in 2003.

## THE TECHNOLOGY

The two biomass heaters have a capacity of 200 kWth and 150 kWth, and burn wooden chips from cleaning-up operations in the municipal forests. The heaters were manufactured by TRACTANT FABRI, a Czech company. The annual energy production amounts to approx. 2 400 GJ and thus approx. 420 tons of lignite can be saved in a year.

## ECONOMIC EFFECTS

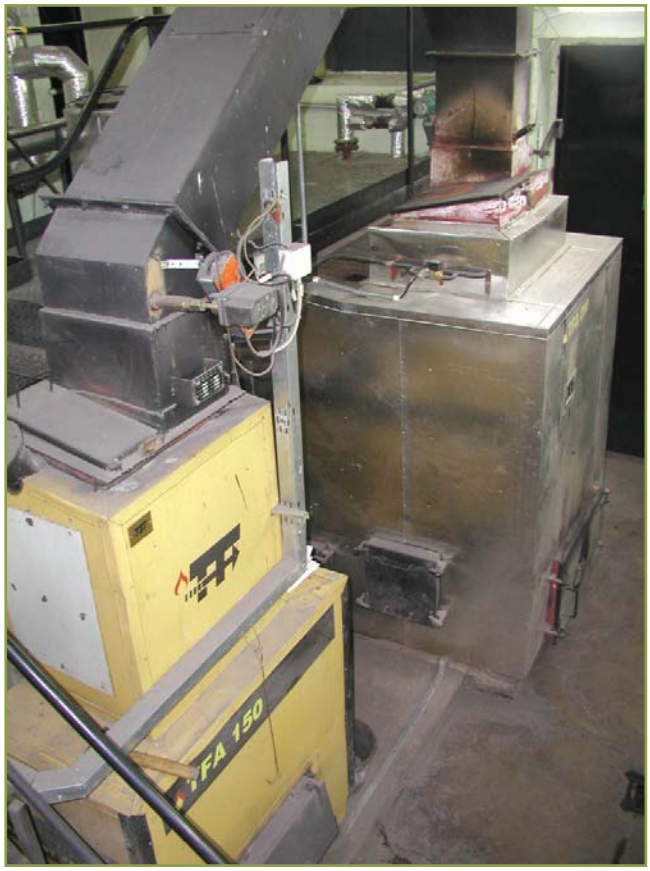
The shift towards biomass fuel in the heat supply for the municipal buildings saves annually about EUR 8 000 for the village budget, even despite the fact that about 60 percent of the project costs was financed by commercial loan. The repayment of the loan and the maintenance of the installation are completely covered by selling some heat to a regional authority, owner of one of the supplied buildings, a home for elderly people. About EUR 9 000, the amount previously spent on coal and paid as a fee for polluting the air, is now saved for the municipal budget.

## SOCIAL EFFECTS

Five communal buildings are supplied with the produced heat: a school and kindergarten, a home for elderly people, a library, a tourist hostel and the municipality office.

The income collected from the two projects (biomass and wind) is partly used to improve the village facilities, such as construction of new children's playgrounds and the renewal of sports grounds, and partly is fed into the Fund for Environment. Thus, the citizens can get support if they want to convert their heating system to biomass (up to 30 percent as subsidy and 30 percent as interest-free loan). Free wireless internet for the entire village was also financed from the funds raised thanks to renewable energy projects.

More than 25 people are employed directly in the projects. They are mainly seasonal workers taking care of the wood chip supply and operation of the heaters, and jobs were also created in the tourist information centre and in the department which prepares further sustainable energy projects. More than 10 000 visitors are attracted by the results of the projects every year, which generates further jobs in the village.




## ENVIRONMENTAL EFFECTS

The biomass heaters significantly reduced the air pollution in the village, saving more than 400 tons of low quality lignite every winter. The windmills are additional electricity sources, preventing the emission of approx. 1 500 tons of C02 if compared to other electricity generation methods using fossil fuel.

## DIFFICULTIES, PROBLEMS

The windmills provide only 12 percent of the total installed capacity, and the wind energy project is economically viable only due thanks to significant subsidies. Still, it serves as a good example of how renewable energy can bring economic and social benefits to municipalities and development to remote and rural regions. If similar wind energy projects are planned more carefully, with an at least one-year wind intensity measurement, they can bring even higher benefits with less or no subsidies.

## FOLLOW-UP

The municipality also has plans for future renewable energy and energy efficiency projects. It supports the conversion of household heaters to biomass and in the summer of 2006 it started the construction of its first ten passive houses. The houses are sold for a reasonable price, with the intention to attract young, new families to the village.

*FURTHER INFORMATION*
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# HUNGARY → GÖDÖLLŐ

## 10 KWP CAPACITY PHOTOVOLTAIC SYSTEM AT THE SZENT ISTVÁN UNIVERSITY, GÖDÖLLŐ


| | | |
|---|---|---|
| **Place of investment**<br>Hungary, Gödöllő | **Installed capacity (kW/MW)**<br>9,6 kW | **Project cost (gross)**<br>~ 62,400 EUR<br>Around 4 EUR/W (panel modules cost)<br>6-6.5 EUR/W for all the system |
| **Project type**<br>Communal | **Number of users of generated energy**<br>~1000 persons (students at the dormitory) | **Type of replaced energy resource**<br>grid electricity |
| **Start of operation**<br>08 Oct. 2005 | **Financial support**<br>PV Enlargement Project of the European Union, Ministry of Environment and Water (KvVM) | |
| **Owner**<br>Szent István University | **Investor**<br>Szent István University | **Contractor**<br>Gaiasolar Ltd |

## THE PROJECT

The Physics and Process Control Department of the Szent István University has been dealing with the issue of researching and developing of photovoltaic systems for a considerable time. The constructed PV system is the largest currently existing construction in Hungary primarily built for educational and demonstrative purposes. Needless to say, besides the connected research tasks, these cells produce electricity as well that is fed in and used in the electric grid of the C dormitory building serving as the location of the investment.

The milestones of the investment are as follows:

- Determination/ selection of the system to be installed
- Selecting the location (e.g. no shadow, facing south, simple feeding)
- Modelling capacity of photovoltaic power station to be installed
- Testing measurements prior to installation
- Installation

The investment directly affects the resident students of the dormitory and has indirect influence on all students and professors. What is more, the residents of Gödöllő town also make use of this system through educational use and since the facility can be visited, it also serves an informative purpose.

## THE TECHNOLOGY

The photovoltaic system is composed of three subsystems applying various technologies. One module is made up of 32 pieces of type ASE-100 (manufactured by RWE Solar GmbH) with a capacity of 105 Wp, and the other two subsystems are each composed of 77 pieces of type DS40 (manufactured by Dunasolar Ltd) modules of 40 Wp capacity. The total installed capacity of this system amounts to 9.6 kW with the total surface of solar cells of 150 $m^2$. The generated energy is converted by three inverters to 230 V, 50 Hz alternating current required for the feeding in the electric network. The Constructor of this project was the Gaiasolar Ltd.

The estimated amount of annually generated energy is 10,000-12,000 kWh depending on the weather of the given year. This level did not reach 10,200 kWh in the first year of operation.

The expected lifetime of the system is 25-30 years (certain elements, for instance, solar cells come with a twenty-year guarantee).

## ECONOMIC EFFECTS

This "mini power station" was constructed within the framework of the PV Enlargement Project of the European Union. In addition to the basic financing of the EU, the project was also supported by the so-called KAC (Environmental Fund Targeted Appropriation) Program of the Ministry of Environment and Water. The necessary self-financing amount was ensured by the Szent István University - primarily by professional experts' job. The success of the EU project was also enhanced by the widespread international connections of the project leader, Prof. Dr. Farkas István department leader and university teacher.

As for the payback period of the investment, originally 15 years were defined; however this period was shortened due to the increase of energy prices taking place in the meantime.

## SOCIAL EFFECTS

At the acceptance of the system, the project received national and international media coverage both in the press and on the Internet. Since the system was put in operation the university receives visitors (student groups, expert teams) not only from the immediate surroundings of Gödöllő but also from all over Hungary.

In addition to energy generation, the mini solar power station also fulfils demonstrative, educational and research purposes. As solar cell modules are dependent on various technologies, it is possible to perform comparative measurements. The information board in the central building of the SZIU dormitory provides information on continuous operation, the amount of energy fed in the network and of the amount of related carbon dioxide savings. On the Internet site of the system, not only the basic characteristics of the system are accessible but soon also the amount of generated energy and the level of CO2 savings will be available.

## ENVIRONMENTAL EFFECTS

In accordance with preliminary calculations (with 0.81 kg/kWh value) an amount of 8,100-9,720 kg emitted CO2 is saved annually.

During almost one year of its operation the system produced a total amount of 10,173 kWh energy until 7th October 2006 resulting in 8,262 kg $CO_2$ emission savings.

## DIFFICULTIES, PROBLEMS

As a budgetary institution, the gravest difficulty encountered was the collection of funds required for the investment.

A great deal of effort was devoted to authority licensing (compilation of designs, obtaining permits, etc.) all the more so since colleagues from the department elaborated the project in detail parallel to their educational tasks. Invaluable help was received from the University Investment Directorate partly in the above tasks as well as the adoption of the public procurement procedure.

## FOLLOW-UP

The long-term plan is to possibly establish a solar collector system on the top of the building adjacent to the dormitory facility housing the already constructed system.

*FURTHER INFORMATION*

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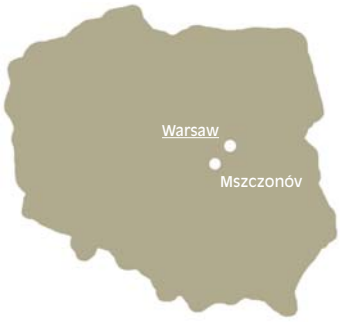
# POLAND → MSZCZONÓW

## GEOTHERMAL WATER HEAT RECOVERY IN MSZCZONÓW




| Place of investment | Installed capacity (kW/MW) | Project cost (gross) |
|---|---|---|
| Poland, Mszczonów | 6,4 MW | EUR 3,16m |
| **Project type** | **Number of users of generated energy** | **Type of replaced energy resource** |
| Communal | 4,000 users (approx. 1 200 homes and public buildings) | Coal |
| **Start of operation** | **Financial support** | |
| May 2000 | Polish EcoFund, Bank loans | |
| **Owner** | **Investor** | **Contractor** |
| Geotermia Mazowiecka S.A. | Geotermia Mazowiecka S.A. | Hove and Olsen I/S Denmark |

## THE PROJECT

In August 1996 the Polish Committee for Scientific Research and the Mszczonów Municipality started to investigate the possibilities for developing a geothermal plant by reconstructing an existing old closed well in Mszsczonów. A 4.1 km deep well, drilled in the 1970s, was chosen for exploitation purposes. The geothermal aquifer is located in a Lower Cretaceous sandstone layer, which contains high quality drinking water (the concentration of total dissolved solids (TDS) is less than 1 g/l). The geothermal plant uses 40°C water, discharged from a single well, for both heating purposes and drinking water production. This was a very important experience, considering that there are thousands of similar abandoned wells in Poland, and some of them may have high potential for geothermal energy utilization.

The milestones of the project were as follows:

- Reconstruction of Mszczonów IG-1 well, providing technical conditions which ensure long-term operation;
- Accessing the geothermal horizon; activation of water production and stabilization of chemical parameters of the produced water;
- Creation of a modern thermal energy source based on an absorption heat pump (using 40°C thermal water as a low heat source);
- Optimal two-way usage of geothermal water for heating and for drinking purposes.

## THE TECHNOLOGY

The plant, having a total capacity of 10.2 MWth, operates with an absorption heat pump (2.7 MW total installed power), supplemented by a high-temperature gas boiler of total power of 1.8 MW. This system is working in conjunction with two low-temperature gas boilers (4.6 MW total installed power) and a 0.6 MWth cooler representing state-of-the-art heating technology. The thermal energy produced by the district heating company in Mszczonów is 37 000 GJ per year, including 40 percent geothermal and 60 percent gas. In the heating season, approx. 30-35 percent of total heat sales come from geothermal water (27 TJ in 2003). When cooled down in the heat pump, the geothermal water is suitable for drinking (TDS 0.5 g/l), and it is supplied to the waterworks.

Geotermia Mazowiecka is the second installation in Europe utilizing geothermal water for heat production and, after being cooled down, also for communal purposes.

## ECONOMIC EFFECTS

The plant replaced three traditional, low-efficiency heating plants based on coal dust (approx. 4 500 tons/year). Assuming identical work conditions and overheads, the costs of producing 1 GJ of heat in the gas boiler plant and in the coal-based plant are similar (gas being slightly more expensive) while in the case of the Mszczonów geothermal plant the cost of producing 1 GJ is 25 percent lower.

The project has been supported by the Polish EcoFund and bank loans.

## SOCIAL EFFECTS

The most positive effect is the increased attraction of the city. Several conferences have been organised in this topic, and „Geotermia Mazowiecka" S.A became an organic part of Mszczonów city, disseminating the idea of environmental protection.

Information about the project is disseminated in several ways:

- Conferences in this topic
- Guided tours for inland and foreign visitors, school classes etc
- Internet: www.geotermia.com.pl
- Brochures

## ENVIRONMENTAL EFFECTS

The change of heat source from coal to gas and geothermal has had significant environmental effects. The CO2 emission has been reduced by 74.8 percent, CO by 98 percent, SO2 by 100 percent and NOx by 82.9 percent, soot and dust by 100 percent.

Also the urban environment of Mszczonów has been improved by the geothermal project. Nice green areas have been created in the town with water posts with drinkable geothermal water in the centre.

## DIFFICULTIES, PROBLEMS

As the geothermal plant in Mszczonów is based on a more than 20 years old well reconstructed and adapted for the requirements of long-term warm water production, it is necessary to systematically monitor the well casing and other facilities. The sanding-up of the geothermal horizon - first observed upon completion of the reservoir and its testing - needs further systematic monitoring and measurement, and the rock particles carried out by the water from the aquifer to the surface are examined from a mineralogical and petrographical point of view. The chemical composition of the geothermal water, especially the concentration of chlorine ions, also has to be analysed regularly, because an increased concentration of chlorine may affect the water's suitability for drinking purposes.

Due to limited funding potential and unfavourable development in relative energy prices, Geothermia Mazowiecka S.A. currently faces some economic difficulties which have prevented the extension of the consumer base beyond the original 60 percent. The staff of 30 persons, formerly employed by the district heating company, has been reduced to only 3 persons working in the geothermal plant. Since the area is severely affected by unemployment, this has naturally caused some social dissatisfaction locally.

## FOLLOW-UP

Recently, the Municipality of Mszczonów has initiated activities aimed at the construction of swimming and recreational facilities based on geothermal water.

*FURTHER INFORMATION*

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# SLOVAKIA → CEROVÁ

## WIND PARK CEROVÁ


| | | |
|---|---|---|
| **Place of investment**<br>Slovakia, Cerová village | **Installed capacity (kW/MW)**<br>2.64 MW (4 x 660 kW) | **Project cost (gross)**<br>EUR 3 000 000 |
| **Project type**<br>Communal | **Number of users of generated energy**<br>approx. 2000 households | **Type of replaced energy resource**<br>Grid electricity |
| **Start of operation**<br>October 2003 | **Financial support**<br>PHARE funds (60 percent), Slovak state budget (17.5 percent) | |
| **Owner**<br>Cerová municipality | **Investor**<br>Cerová municipality | |
| | **Contractor**<br>Green Energy Slovakia s.r.o. (Limited company), Bratislava | |

## THE PROJECT

The main goal was to implement a pilot project of wind energy utilization in Slovakia. The municipality of Cerová village and the Slovenské elektrárne a.s. electric utility initiated this project. Since 2000, Cerová village and Green Energy Slovakia Ltd. have been responsible for the implementation. The first wind park of Slovakia is located on the Vápenková rock, above Cerová village, on the side called Rozbehy.

The short history of the project:

- 1999 - 2000 - wind energy potential measurements (speed and direction)
- 2000 - evaluation of the measurements; preparation and elaboration of a feasibility study; initial steps for obtaining land-use and building permission, funds from PHARE (programme for trans-border cooperation between Austria and Slovakia) and subsidies from the Slovakian state budget
- 2001 - the building permission was issued
- 2001 - 2002 - selection of the technology supplier
- 2002 - 2003 - construction
- 2003 - supply and assembly of the technology
- 2003. október - start of the test operation

## A TECHNOLÓGIA

The wind park consists of four Vestas V47/660 turbines of height of 76 m. The fiberglass rotors have a diameter of 47 m. The total installed capacity of the turbines is 4x660 kW. The project was managed by Green Energy Slovakia Ltd. located in Bratislava, and the assembly work has been carried out by Aufwind Schmack Regensburg, a German company. Since the start of the operation, the turbines have generated more than 14 000 000 kWh electric power altogether (1 744 374 kWh in 2003, 5 518 240 kWh in 2004, 5 187 935 kWh in 2005), exceeding the original expectations by 15 percent. The power production in 2006 will presumably be lower than in the preceding years, mainly due to changing climate conditions. The average capacity factor of the wind park is above 20 percent.

## ECONOMIC EFFECTS

The total investment costs amounted to EUR 3 000 000. The project was co-financed by EU sources (PHARE program) and the state budget of the Slovak Republic. The remaining amount (EUR 675 000, 22.5 percent) was provided by the local municipality. The expected

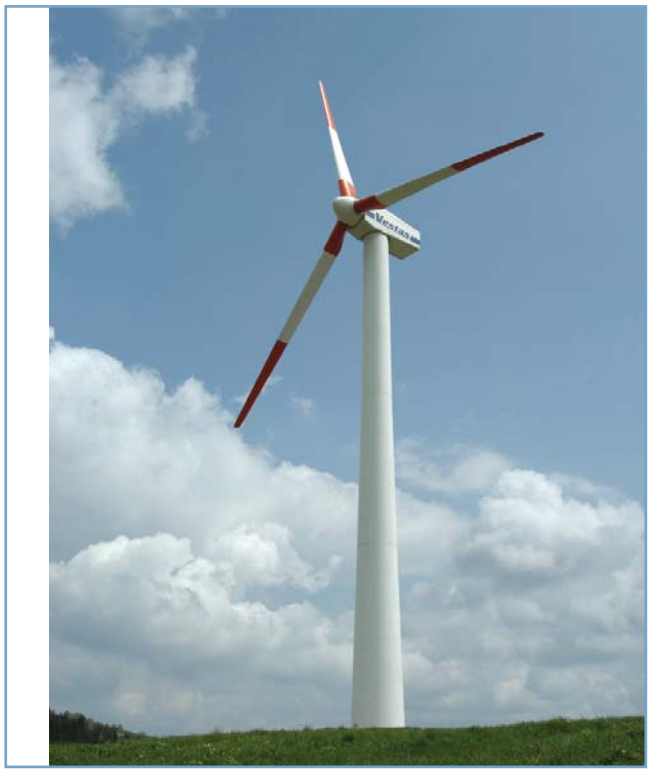
life time of the wind park was 25 years. Taking the former feed-in tariff (1.50 SKK/kWh or 3.94 Euro cent/kWh, as of 1 August 2006) into account, the originally calculated payback period of the total investment, including funds from the EU, was 15-17 years.

The decree of the Regulatory Office for Network Industries dated from 30 June 2005 increased the feed-in tariffs for all renewable energy sources for the year 2006. The feed-in tariff for wind turbines which started operation before 1 January 2005 was increased to 2.50 SKK/kWh (6,56 Euro cent/kWh as of 1 August 2006), so the expected payback period might be shortened.

## SOCIAL EFFECTS

Since the start of the project, the wind park has been positively perceived by the citizens of the village. During the construction phase 10 temporary jobs were created. After the installation has been put into operation, a half-time worker is needed for control, data collection and communication with the distributor and the grid operator within the warranty period. After the warranty period expires, one full-time workplace will be created.

Since its completion, the wind park attracts approx. 200-300 tourists to Cerová every day. The wind park is often visited by technicians, experts and representatives of other Slovak municipalities also. The implementers of the project and the mayor of Cerová have presented this pilot project at many technical conferences, workshops and seminars. The project was widely promoted in the Slovakian printed and electronic media.



## ENVIRONMENTAL EFFECTS

The project had three main goals:

- presenting a good model for wind energy utilization
- reducing CO2 emissions
- generating green energy, green electricity

The annual savings of CO2 was 4 800 tons/year for the period 2003-2005.

## DIFFICULTIES, PROBLEMS

The main problem regarding investment planning in the field of RES is that the Regulatory Office for Network Industries can only guarantee the feed-in tariffs for at most 4-5 years. Therefore it is absolutely necessary to adopt an Act on renewable energy sources or an Act on support of electricity generated by renewable energy sources that would guarantee the feed-in tariff for a period of 15-20 years, which is necessary for accountable planning.

## FOLLOW-UP

In April 2006 Green Energy Slovakia presented the study of a new wind park in Cerová (Cerová II., locality Kopánky) with a total installed capacity of 4 MW (two VESTAS V80 turbines, 2 MW each) and expected annual electricity production of 8 500 000 kWh. On the basis of earlier experience, this project is expected to start in the second half of 2007.

Green Energy Slovakia Ltd. hence forth will perform its own wind speed and direction measurements at various locations in Slovakia, and has presented 13 new wind energy utilization projects altogether, including Cerová II.

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## CZECH REPUBLIC

### Solar House for Social Home in Slatiňany

| | |
|---|---|
| **Installed capacity**<br>90 kW solar collectors, 37 kW heat pump<br>49 kW biomass boiler<br>< 1 kW photovoltaics | **Project cost (gross)**<br>EUR 155 000 solar collector + heat pump<br>EUR 39 000 biomass boiler<br>EUR 12 000 photovoltaic panels |
| **Start of operation**<br>1996 - solar collectors and heat pump<br>2000 - biomass boiler<br>2004 - photovoltaic panels | **Type of replaced energy resource**<br>Natural gas |
| **Number of users of generated energy**<br>Approx. 100 clients with mental and combined disabilities and staff | **Financial support**<br>State Environmental Fund |

### THE PROJECT

The Institute of Social Care in Slatiňany provides services for more than 300 people with mental and combined disabilities for both short and long-term therapies and residence. In 1994, when an old farm-house was to be reconstructed to accommodate new, protected workshop rooms and housing, the management decided to utilize as much renewable energy as possible to cover its energy needs.

The Solar House is heated with solar collectors placed on the roof, and a biomass boiler. In winter, a heat pump utilizes the low temperature heat which was collected during summer and autumn, and stored in a large tank. Long-term, cross-seasonal warm water accumulation and a sophisticated monitoring and control system powered by PV panels are the key factors leading to very high efficiency of the renewable energy utilization in the integrated installation. The house is practically self-sufficient in meeting its hot water and heating needs.

### ECONOMIC EFFECTS

The social home saves about EUR 14 000 per year on its natural gas bills. Unfortunately, the project would hardly be replicable without financial support. This highlights a clear need for a legal framework providing conceptual and systemic support for heat production from renewable sources.

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## CZECH REPUBLIC

### Centre for Application of Renewable Energy Sources of the Christian Orthodox Academy in Vilémov

| | |
|---|---|
| **Installed capacity**<br>Approx. 50 kW solar + biomass on spot<br>100 kW wind generator | **Project cost (gross)**<br>overall costs: approx. EUR 130 000 |
| **Start of operation**<br>1998 - 9m2 solar collector<br>2002 - 15 $m^2$ solar collector + PV | 2000 - biomass heater,<br>2003 - wind generator |
| **Number of users of generated energy**<br>Several hundred people a year | **Financial support**<br>State Environmental Fund<br>and German foundation DBU |

### THE PROJECT

The demonstration centre in Vilemov is unique in the sense that it is run by a church based organization, and that a wide range of technologies have been installed. The Orthodox Academy utilises solar energy to make its domestic hot water, a biomass boiler to supply heat during winter and a demonstration PV array. The 100 kW wind generator brings an income, through the fixed preferential feed-in tariffs, to support educational and religious activities.

The Academy also promotes the use of renewable energy for other church institutions. It has successfully started the project called "Church for the future: fifty solar roofs". It aims to install simple solar systems on all churches, seminaries, presbyteries and social homes to further spread the technology amongst members of the church. So far thirty installations have been carried out.

### DIFFICULTIES, PROBLEMS

The main obstacle the Academy has met during its promotion of the "50 solar roofs" project was the rigid attitude of the cultural heritage protection institutions. These often reject the installation of solar collectors on churches and presbyteries without any consideration.

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## CZECH REPUBLIC

### Biomass combustion plant in Kardašova Řečice

| | |
|---|---|
| **Installed capacity**<br>2x2.5 MWth | **Project cost (gross)**<br>approx. EUR 650 000 |
| **Start of operation**<br>1994 (first phase) | **Type of replaced energy resource**<br>Hard coal |
| **Number of users of generated energy**<br>1 200 | **Financial support**<br>80 percent State Environmental Fund, 20 percent municipality of Kardašova Řečice and the private operator of the heat supply system |

### THE PROJECT:

The aim of the municipality of Kardašova Řečice was to replace an inefficient hard-coal boiler supplying heat to residential buildings in the town. In 1994 the heaters were reconstructed and the first phase of the construction of the distribution grid was started. The new combustion units burn wood residues from a carpentry plant. Further houses were connected to this heat supply source in 1999 and 2001. Now they provide about 1 200 people in 180 flats and 120 family houses, five municipal buildings and a few private enterprises on the site of the former big factory with heat (approx. 6 000 MWh per year).

The reconstruction and the operation of the heating supply system have been done in a Public Private Partnership scheme. The private company owns the heater and rents the municipally owned distribution tubes for a symbolic price. In return, the company provides heat to the citizens for a reduced price, which is now at a level of about half the usual price for heat in the region.

### ENVIRONMENTAL EFFECTS

The 6 000 MWh/year heat would require burning about 1 000 tons of hard coal every year. The replacement of the coal boilers and higher efficiency of the district heating system result in savings of more than 2 000 tons of carbon dioxide emissions.

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## HUNGARY

### Village heating following Austrian example in Pornóapáti

| | |
|---|---|
| **Installed capacity**<br>2 x 600 kW | **Project cost (gross)**<br>EUR 1,4m (HUF 350M) |
| **Start of operation**<br>28th October 2005 | **Type of replaced energy resource**<br>Coal |
| **Number of users of generated energy**<br>97 residential properties | **Financial support**<br>PHARE CBC 2002, Ministry of Internal Affairs, Austrian Environmental Protection Fund, West Pannon Regional Development Council |

### THE PROJECT

The example for biomass-based long-distance heating was set by the village of Bildeinben (Beled) in the neighbouring Austria where a similar village heating system has been in operation since 1994. The Municipality decided to launch a not dissimilar project if the residents of the village of Pornóapáti were ready to cooperate. The residential decision in favour of the investment was made in April 2003 and a year later the village representatives signed the support scheme contract which was indispensable for the implementation since self-financing was not feasible.

The idea of this investment was unique in Hungary since beforehand there had been no other long-distance heating system anywhere which would have entirely been based upon renewable energy sources from the very beginning. Biomass heating uses wood chips from lumber mills and other forestry wastes produced in the surrounding areas as basic heating materials.

### ENVIRONMENTAL EFFECTS

Planned replacements:

| | |
|---|---|
| Coal: | 347 t/year |
| Firewood: | 260 t/year |
| PB gas: | 4.9 t/year |
| Electricity: | 370 MWh/y. |
| $CO_2$ replacement: | 1,168 t/year |

Planned emission-reductions in terms of air pollution:

| | |
|---|---|
| $SO_2$: | 5.4 t/year |
| CxHy: | 6.6 t/year |
| CO: | 43.4 t/year |
| Dust: | 0.38 t/year |

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# HUNGARY

## Wind Power Station in Vép

| | |
|---|---|
| **Installed capacity**<br>600 kW | **Project cost (gross)**<br>EUR 880 tnd |
| **Start of operation**<br>04th September 2005 | **Type of replaced energy resource**<br>Grid electricity |
| **Number of users of generated energy**<br>The residents of Vép (3700 people) | **Financial support**<br>West Pannon Regional Development Council, PHARE CBC |

### THE PROJECT

The wind power plant first implemented in Vas county is a true pioneer also because it is in community ownership, that is the owners are the village of Vép and the residents of the village. The electricity generated is fed into the grid. The owners have taken on a commitment, based on a separate agreement, that they would settle the complete bill for public lighting for the village of Vép from the income derived from the sale of the generated electricity.

### FOLLOW-UP

AThe wind power plant constructed so far is the first stage of the investment. The second phase consists of the construction of three additional wind power stations with a total installed capacity of 4.8 MW. An additional 16 wind power plants would be constructed within the framework of the third stage adding up to a total of 32 MW installed capacity. The network connection contract and the Hungarian Energy Office permit are still missing for the implementation of the second phase.

As for the completion of further phases, they would have overwhelming additional influence on the life in the village of Vép since, in accordance with the agreement signed with the Municipality, the Szélerő Vép Kht spends most of its income on community purposes thus supporting local developments concerning education, tourism and infrastructure.

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# HUNGARY

## Geothermal energy utilization in Hódmezővásárhely

| | |
|---|---|
| **Installed capacity**<br>10 MWth | **Project cost (gross)**<br>approx. EUR 2,2m (HUF 580 M) |
| **Start of operation**<br>1st phase- May 1998<br>2nd phase- August 2003 | **Type of replaced energy resource**<br>Natural gas |
| **Number of users of generated energy**<br>approx. 30,000 people | **Támogatók:**<br>European Union PV Enlargement and Ministry of Environmental Protection |

### THE PROJECT

In the Hódmezővásárhely thermal project investors set two targets: on the one hand, to replace the hot water supply produced in the local distance heating centre from cold water with the use of natural gas. On the other hand, they wished to replace natural gas in long-distance heating. The first target could be achieved with the use of thermal water of 43-50oC temperature of potable water quality produced from layers at a depth of 1,000-1,300m. The long-distance heating issue was settled with thermal water of 80-85oC temperature from a depth of 2,000m. The cooled down fluid that was not suitable for further use was compressed back to the layers close to the opening pursuant to environmental protection regulations.

This project replaces an annual amount of 2.5 million m3 natural gas and satisfies the entire hot water demand of 3,000 residential properties and several public institutions (hospital, schools, offices, etc.) and meets over 50% of the heating demand with the use of geothermal energy.

### SOCIAL EFFECTS

The town has established a considerable reputation due to the unique nature of this project; the investment was one of the professional programs at the European Geothermal Conference in 2003. Subsequent to this venue, several foreign professional, municipal and investor delegations visited the town.

*FURTHER INFORMATION*
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## POLAND

### Biomass heating in Lubań

| | |
|---|---|
| **Installed capacity**<br>8 MWth | **Project cost (gross)**<br>Approx. EUR 1.678m + VAT |
| **Start of operation**<br>2001 | **Type of replaced energy resource**<br>Coal |
| **Number of users of generated energy**<br>60 percent of Luban community | **Financial support**<br>43 percent donation (EkoFundusz),<br>20 percent credit (WFO_iGW) |

### THE PROJECT

The main goals of the project were to reduce the air pollution caused by coal combustion, to limit the heat consumption of the city and to introduce a new ecological technology for heat generation based on straw combustion.

In the first phase, between 1997 and 1999, a heat exchange centre was constructed, 28 heat distribution centres were modernised, and the first straw-fired boiler of 1 MWth capacity, together with a 800 $m^2$ straw warehouse, was built. In the second phase, the project was completed by constructing the boiler house with two additional straw-fired boilers (3.5 MWth each) and another straw warehouse (1 000 m2). The boiler houses can use coal boilers as well as split straw boilers. The total installed power capacity amounts to 8 MWth with an efficiency of 84 percent. The project increased the seasonal job demand (mainly in the summer season) in the region and also created two new permanent jobs related to the biomass supply. The heating costs for the final consumers could be reduced by 15 percent, thanks to the modernization and the shift to biomass.

### DIFFICULTIES, PROBLEMS

There were some initial difficulties in organising the biomass (straw) supply chain, and another problem was that the attempts to realise some income from the reduction of the emission of greenhouse gases through the emission trading system were unsuccessful.

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## SLOVAKIA

### Geothermal Energy System in the city of Galanta

| | |
|---|---|
| **Installed capacity**<br>8 MWth geothermal heating plant | **Project cost (gross)**<br>EUR 2,76m |
| **Start of operation**<br>1996 | **Type of replaced energy resource**<br>Natural gas, coal |
| **Number of users of generated energy**<br>1 300 homes, municipal hospital with health care facility, schools, kindergartens, house for pensioners, stores | **Financial support**<br>Long-term loan from Nordic Investment Bank Helsinki (NIB). |

### THE PROJECT

In 1983 and 1984 two geothermal wells were established in Galanta with the aim to be the source of heat for 1 236 homes in residential district Galanta-Sever (North), the St. Lucas hospital and other municipal buildings. Due to lack of funds, this goal could only be accomplished after the political and social change. Galantaterm Ltd. was established in 1995, it started operation in 1996. The major owner of the company is the Galanta municipality; other shareholders are Slovakian, Icelandic and Finnish companies.

### THE TECHNOLOGY

Geothermal energy fully covers the heat demand when the daily average outer temperature is at least 2oC. Below this temperature, natural gas as peak heat source is burnt to provide the supplementary heat. Natural gas also serves as backup in case of failure of the geothermal wells. The company produced 26 310 MWh heat energy in 2005, of which 22 356 MWh originated from geothermal sources, the remaining 3 954 MWh from natural gas. The total installed capacity of the boiler room was 10 MWth.

In Galanta city the heating season lasts from October to May, and starts when the mean outer temperature drops below 13oC for three consecutive days. Domestic hot water is supplied all around the year.

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## SLOVAKIA

### Reconstruction of boiler room in Nová Dubnica - Installation of boilers for biomass combustion

| | |
|---|---|
| **Installed capacity**<br>2x7 MWth (two biomass firing boilers)<br>2 MWth container turnkey boiler unit | **Project cost (gross)**<br>EUR 3 674 830 |
| **Start of operation**<br>First boiler: end of 2004<br>Second boiler: December 2005 | **Type of replaced energy resource**<br>Natural gas |
| **Number of users of generated energy**<br>3 500 homes | **Financial support**<br>EU Structural Funds: EUR 656 209<br>Bank loan: EUR 3 119 550 |

### THE PROJECT

The heat supply of Nová Dubnica completely depended on imported natural gas. Because of the gradually increasing natural gas prices, and to increase the energy efficiency of the heating systems, Datatherm decided to switch to wood chips as the base fuel in the central heating system.

In two steps, the natural gas-fired boilers had been replaced by two wooden chips-fired boilers of capacity of 14 MWth altogether, plus a 2 MWth container turnkey boiler unit. The expected lifetime of the installed technology is approx. 20 years.

### ECONOMIC EFFECTS

TERMONOVA joint stock company decided to finance the investment by means of a bank loan, therefore some requirements related to the bank loan guarantee had to be satisfied. The company initiated negotiations with the local branch of the International Finance Corporation (IFC), a member of the World Bank Group, and applied for support through a special programme of IFC called "Commercialising Energy Efficiency Finance". The negotiations were successful, and TERMONOVA obtained the first bank guarantee in Slovakia from IFC/CEEF. The estimated payback period of the loan was 4-5 years. The project was partially supported by the EU Structural Funds as well.

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## SLOVAKIA

### Substitution of fossil fuels by biomass in the district heating of Hriňová city

| | |
|---|---|
| **Installed capacity**<br>1,9 MWth | **Project cost (gross)**<br>EUR 524 976 |
| **Start of operation**<br>May 2006 | **Type of replaced energy resource**<br>Natural gas, coal |
| **Number of users of generated energy**<br>Approx. 3.000 residents in the communal sector | **Financial support**<br>65% EU Structural Funds and state budget |

### THE PROJECT

INTECH Slovakia Ltd. is a company which provides complex services in the field of energy efficiency. It acquired the Heating Management of Hriňová City (Ltd.) with the aim to play a more crucial role in the field of municipal energetics.

The inhabitants and enterprises in Hriňová were previously supplied by conventional energy sources: natural gas and lignite. After the acquisition, the shift in energy source to biomass, the modernization of the heat exchanging stations and the heat conveyances has begun. One of the main goals was to prevent the increase of heating prices in a period of gradually rising prices of energy sources, especially fossil fuels.

### THE TECHNOLOGY

80 percent of the generated heat is provided to the central heating system in Hriňová for the supply of 1 000 homes, one school and some premises, the remaining 20 percent is provided to Hriňová machinery plant. 63 percent of the all currently produced heat originates from biomass.

INTECH Slovakia Ltd. established its own division "BIOFUELS", which has all the necessary tools for biomass processing (wood-chipping machine, saws, tractors and other vehicles). This division controls the whole cycle of heat generation from biomass, ensuring that all biomass related needs are met.

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# SLOVAKIA

## Solar-thermal district heating in Žilina

| | |
|---|---|
| **Installed capacity**<br>185 kW | **Project cost (gross)**<br>EUR 65 622 |
| **Start of operation**<br>November 2003 | **Type of replaced energy source**<br>Coal, natural gas, lignite |
| **Number of users of generated energy**<br>470 homes, kindergarten, store and laundry | **Financial support**<br>None (only commercial bank loans) |

### THE PROJECT

Žilina The heat supply in the residential district "Hliny" of Žilina is provided by a heat exchanger (with steam or hot water medium), which operates with a solar thermal system to pre-heat drinking water. Solar thermal collectors were installed at the heat-exchanging station. The system began operation in November 2003. 132 solar collectors should generate at least 100 MWh of thermal energy annually, with a maximum outlet temperature from the solar buffer at 35°C. Domestic hot water was supplied to 470 homes, a kindergarten, a store and laundry facilities.

The solar energy utilization project in the residential district of Hliny is considered as a demonstration/pilot project, since it is the first solar thermal system installed in a district heating system in Slovakia.

### ENVIRONMENTAL EFFECTS

Reduction of emissions (including greenhouse gases) and pollutants results from the clean solar energy utilization, without any negative environmental impact in the entire time of the operation. The estimated amount of $CO_2$ reduction is 40 tons per year. To measure the overall reduction of negative impacts is more difficult, as the heat exchanger is connected to steam piping from a large CHP source, firing mainly lignite. Overall reduction of $CO_2$ - 160t/y.

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Please find the full-length version of the previous project descriptions in Hungarian language at www.energiaklub.hu the English version at www.agreenet.info.