



## THE PROJECT

The project “Energy Efficiency for End Users of District Heating in Bulgaria” showed that residential heat consumers who had been disconnected from district heating largely due to inability to pay their heat bills were able to afford re-connection and pay lower heat bills after they made energy efficiency improvements. When the project idea was introduced in 1999, the Bulgarian economy was severely struggling and many people could not afford to pay for the basic services.

In Pleven, a city of 140,000 residents, 47 percent of the district heating company service area (4,369,120 m<sup>3</sup>) had been disconnected, affecting a large number of residential consumers (see Table 1).

Housing block	% disconnected
Block “Buria”	65
Block “G. Kotchev”	58
Block “Uragan”	61
Block “Spartak”	50
Block “Neofit Rilsky”	47
50 – 52 “Ivan Vazov” Street	47
54 – 56 “Ivan Vazov” Street	56
56 – 58 “Ivan Vazov” Street	38

Table 1: *Percentage of disconnected radiators in multi-apartment housing blocks before project implementation (1999-2000).*

At the request of the Bulgarian government, project implementation began in 2000 within the framework of the Dutch Program for Co-operations with Countries in Central and Eastern Europe, financed by the Dutch Ministry of Economic Affairs (SENTER PSO). Key partners included Ameco Environmental Services, the project’s executing agency, in consortium with PEJA International B.V., Consultant Energy Production Systems (CEPS) from the Netherlands, and the Centre for Energy Efficiency EnEffect in Bulgaria. The

### Key Results

- Energy Savings: 658MWh/year
- Cost Savings: US \$15,300/year
- Municipalities affected: City of Pleven, Bulgaria
- Measures introduced: metering of heat consumption increased by 96 percent; residents were reconnected to the heating network

project hosts are Toplofikatsiya Pleven Sole-Proprietor Joint-stock Company (District Heating Pleven), the residential and municipal project sites, and the Municipality of Pleven in its capacity of host-authority and the owner of some of the sites. The project had full support from the management of the district heating company, in the person of Mr. Ivan Getov, M.Sc. (Eng.), the Mayor of Pleven Mr. Nayden Zelenogorski, and the Deputy Mayor Mr. Krassimir Makedonski.

The heat demand in Pleven exceeded production due to profound heat losses in residential buildings. This demand-supply imbalance resulted in high district heating costs and made the basic comforts of heating unaffordable for many of the city’s residents. The high heat loss resulted from:

Deteriorated condition of building envelopes and in-house space heating systems;

- Lack of knowledge and experience among district heating customers about financial and energy-saving measures related to space heating and domestic hot water consumption;
- Lack of metering and consumption-based regulation of energy consumption;
- Lack of interest and motivation from consumers to accept available methods to control and meter consumed heat;



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- Lack of billing methods that would encourage more efficient end-user consumption of heat.

### PROJECT APPROACH

The following were the numerous objectives of this project:

- To reduce end-use heat consumption in the apartment buildings;
- To create conditions that would enable residential consumers to accept metering and consumption control technologies, as well as consumption-based billing methods;
- Expansion of the Bulgarian energy-efficiency market, especially to Dutch manufacturers of metering equipment, thermal control and regulation, and other energy-saving services;
- Strengthening of the Bulgarian district heating sector by demonstration of demand-side energy conservation measures;
- Dissemination of information about the existing cost-effective opportunities for energy savings through space heating and hot water to district heating customers.

The following is a list of energy conservation measures undertaken during this project in residential buildings:

- Installation of individual heat cost allocators and thermostatic valves for radiators;
- Fitting of aluminum foil reflector screens behind the radiators;
- Weather-stripping drafty areas in the apartment buildings;
- Thermal insulation of the hot water pipes;
- Installation of water-saving shower heads in all apartments;
- Installation of heat cost allocators and hot water meters, which allowed remote consumption reading. This was unique to the Spartak apartment blocks.

These measures were implemented in five of the six apartment blocks in 2000-2001. Neophit

Rilski, a typical apartment block, was designated as a baseline reference site. The above-mentioned measures were implemented in this building in April-May 2001 to establish a benchmark for energy savings. For monitoring purposes the billing for heat consumption in this apartment block was done traditionally - according to the volume of heated space. Consumption-based billing was applied to the rest of the project sites.

Another component of this project consisted of energy conservation measures in public buildings, with total investment of approximately US \$400,000 resulting in average financial savings of 30 percent. For more information about this component of the project, please refer to the contact listed at the end of this case study.

### RESULTS

Heat and hot water consumption monitoring was carried out on a monthly basis. Information was collected in real-time through the remote monitoring system and is extremely accurate.

The results indicate that the undertaken measures have been very effective in reducing energy consumption. Since the beginning of the 2004-05 heating season, the performance comparison of four typical residential apartment blocks with the fifth "baseline reference" block reveals energy cost savings of 30-35 percent. When compared to the 2003-04 heating seasons, energy used for heating one cubic meter of hot water was reduced by more than 30 percent, amounting to approximate savings of 658 MWh and US \$15,300.<sup>1</sup>

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<sup>1</sup> Energy consumption data is influenced by the fact that in the "reference building" many of the radiators were disconnected. Also, many of the residents did not use all of the radiators throughout the buildings. The data presented here is the average data for all apartments. More accurate data was obtained for three specific cases: 1). apartments where all of the radiators were used; 2). apartments in which one radiator was not used or disconnected; 3). Apartments where one or more radiators



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The customers who participated in the project have been very enthusiastic. Not only do they appreciate the substantial savings, they also value the improvement in comfort resulting from the ability to control temperature levels and reduce indoor drafts.

At the start of the project, some 50-60 percent of radiators were disconnected in the participating buildings. After project completion, there is no need to disconnect radiators if customers can't afford to pay the heating bills. Now they can simply close the valves and control the amount of heat consumed. Subsequently, all radiators were reconnected after the project; although many customers still choose not to use one or several radiators.

As a result of these measures, indoor temperatures have improved significantly on all premises. The parameters of domestic hot water have also been improved to comply with regulations. Due to the awareness campaign and launch of the information telephone line, Toploficatsiya Pleven received many inquiries from customers who want to implement similar cost-saving measures. The district heating company saw the informational services as an effective way to help customers and, even after donor project support ended, chose to continue the awareness campaign.

Within four years of project implementation, metering of heat consumption had dramatically increased throughout Bulgaria to nearly 96 percent. With metering so widespread, the feasibility of replicating the end-use energy-efficiency measures within the building envelope and the installation of water-saving showerheads and faucets has increased significantly.

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were turned off. As can be expected, energy savings were highest in the first group and less significant in the third group.

### LESSONS LEARNED

The following are the main findings and conclusions from the project:

- Energy-efficiency measures are technically feasible and cost-effective, and they contribute to improving indoor comfort.
- The introduction of heat metering combined with thermal regulation valves and consumption-based billing gives consumers the opportunity to control their costs for space heating and to regulate the indoor temperature levels according to need.
- Heat accounting helps reduce the tension between the energy supplier and energy end-user.

The results achieved in Pleven and the further development of heat accounting across Bulgaria are definitely a success, since almost all district heat customers are now using heat measurement (allocation and meters) and heat end-use consumption is becoming more efficient as a result. Another important success is the fact that a growing number of apartment owners and entire buildings now apply energy-efficiency measures.

Fortunately, Bulgarian energy legislation has improved in unison with the project, which has greatly strengthened the implementation of improvements in energy efficiency. Since heat metering became mandatory, a number of laws and ordinances related to energy-efficiency were updated and preconditions were created for financing energy-efficiency projects in residential as well as public buildings.

Another very important part of the project was the public awareness campaign to make energy-efficiency approaches and results better understood among the general public. The campaign included the following activities during the project:



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- Press conferences, publications in local and country-wide print media, reporting and interviews on local television;
- Kiosks and exhibits with informational materials and energy-saving technologies in prominent places in Toploficatsiya's and Pleven PLC's office reception areas and at the payment offices;
- Public information rooms in Toploficatsia – Pleven PLC.

Materials informing about ways to save energy were developed and disseminated:

- A leaflet for consumers, with instructions for how to control heat consumption through thermostatic valves and energy-saving measures;
- A brochure about the economic, social and environmental benefits of saving energy on use of utilities (heat, electricity, water);
- A brochure about energy-saving directed to students of elementary schools in Pleven;
- Posters promoting energy-saving and providing contact information of the heat company customer service and information center.

The project ended with a seminar where the project implementers reported the results of the installed energy-saving measures described above. More information about the proceedings of this seminar is available upon request (see contact information below).

The keys to the success of the project were above all the professional contributions of the participants and the financial support from the Government of The Netherlands. Projects of this type can be replicated with great effectiveness in Bulgaria because of the improved opportunities for financing energy efficiency and the increased return on investments due to increasing energy prices.

As a result of this project, residential consumers were able to reconnect to district heat systems. As a result of consumption metering, and consumption-based billing, customers can now afford to pay their bills as they are generally lower, and regulate how much heat they consume.

There have been other benefits too, including improved indoor comfort and a reduction in the incidence of seasonal illnesses (influenced by healthier indoor temperatures and fewer drafts).

### *For More Information:*

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