

### PROJECT BACKGROUND

This project provided heat supply service support to two condominiums in Armenia. The project attempted to remove the barriers that are preventing independent operation of boiler houses. The two condominiums where the project was implemented are located in the cities of Yerevan and Gyumri, Armenia.

The project was jointly funded by:

- USAID/AEAI project "Energy Efficiency, Demand-Side Management and Renewable Energy";
- The World Bank project "Republic of Armenia Regional Heat Supply Strategy Development";
- UNDP/GEF project "Removing Barriers to Energy Efficiency and Hot Water Supply System in Urban Heating".

The Yerevan-based condominium consists of 30 multi-apartment buildings, while the one in Gyumri has 65 under its management. One building was selected from each condominium – building No. 7, Rubinyan Street, Yerevan, and 11/3 Paruyr Street, Gyumri. Heat consumption meters and regulation devices (supersonic heat energy meters, hot water flow meters, differential pressure regulators, and rising pipe regulating valves) were installed during the project. The effects of the installation of these technologies on heat energy consumption patterns were monitored and analyzed.

### PROJECT APPROACH

The first phase of the project started during the 2001-2002 heating season. The project implementation was completed in the second phase during the 2002-2003 heating period. The third phase included the monitoring, final summary and analysis of the results.

### Key Results

- Energy Savings: 158,311 kWh
- Cost Savings (residents): USD \$823 (AMD 479,094)
- Policies introduced: meters and regulation devices installed
- Municipalities affected: City of Yerevan; City of Gyumri, Armenia

The first phase was dedicated to providing heating to the building residents. The heat energy consumption meters and regulation devices were installed in the two buildings. In addition, thermostatic valves and heat cost allocators were installed on all radiators in the apartments. All the devices had been purchased from SIEMENS Company. General weatherization works were also implemented in the buildings, including installation and renovation of the entrance doors and windows.

Contracts for heating were signed between the condominiums and the residents of the buildings and also between the condominiums and the heat supply companies: the Yerevan Heat Supply Company and the Gyumri Heat Supply Company. Heat cost allocators were installed on most radiators in the buildings.

The residents were made aware of the goals of the project; the proper use of the metering equipment for evaluation of real heat consumption; the advantages of metering and controlling the heat energy in the apartments; the new fee collection system based on the real consumption of heat energy, which ensures transparent and correct billing; and the expected benefits of the project.

The project was implemented during the second phase. This included monitoring the readings of

the metering equipment on the building and apartment levels during the entire heating period. The heat supply to the pilot buildings started in December 2002. All of the stakeholders participated in the monitoring process – the condominium, the heat supply companies, the residents of the buildings and the project implementing organizations. The condominium managers and residents received practical training on the use of metering equipment for the building and apartment specific levels. The monitoring results were evaluated monthly, and the payment fees calculated accordingly.

### **RESULTS: NO. 7 RUBINYAN STREET, CITY OF YEREVAN**

The 9-story residential building No. 7 on Rubinyan Street has 36 apartments. The heat was supplied by the Yerevan Heats Supply Company. The heating supply to this building was stopped on March 10, 2003, and was off for 94 days. The total heat energy consumption amounted to 157,296 kWh, 4.3 percent of which constituted to illegal water discharge.

The average outdoor temperature during the entire heating season was -2.6°C. According to normative requirements for this temperature, the heat energy to be supplied to the building should equal 291,400 kWh during the heating season. As made evident by the installed metering equipment, there was a huge difference between these normative requirements and the actual heat energy supplied to the residents is 134,104 kWh. This was partially a result of insufficient heat supply to the building, which meant that the temperature in most apartments was 4-5°C less than the normative temperature of +18°C.

The heating tariff for the 2002-2003 heating season (90 days), was set by the Natural Monopoly Regulatory Commission (NMRC) and

reduced by a 33.4% subsidy by the Municipality of Yerevan. The final tariff was as follows:

- 1,100 AMD per 1 m<sup>2</sup>, or
- 9.42 AMD per 1 kWh.

The total heated living space of the building was 1,553 m<sup>2</sup>. In the case of billing for expected services provided based on meters squared, the charges would amount to 1,784,224.00 AMD for 94 heating days. Based on the readings of installed metering devices, the fee for 157,296 kWh of heat energy consumed during the entire heating season is 1,482,130.25 AMD. The difference between the fee calculated based on meters squared vs. the consumption-based fee for the heating is 302,094.19 AMD (US \$519).

### **RESULTS: NO. 11/3 PARUYR SEVAK STREET, CITY OF GYUMRI**

The 4-story residential building No. 11/3 consists of 15 apartments. Gyumri Heating Supply Company provided the heating for the building. The heating was stopped on March 20, 2003, and was off for 104 days. Because of the technical problems associated with the metering equipment, the monitoring of the pilot project was conducted from February 1, 2003 until the end of the heating season, totaling 47 days.

According to the readings of the building heat energy meter, the total heat energy consumption was 50,053 kWh, 35 percent of which was due to illegal hot water discharge.

During the 47 days of monitoring, the average outdoor temperature was -5.07°C. According to the normative requirements for this average temperature, the heat supply for the building should amount to 74,260 kWh throughout the heating season. The difference between these normative requirements and the actual heat energy supplied to the residents is 24,207 kWh.



## Providing Heat Supply Service Support to Condominiums in the Cities of Yerevan and Gyumri, Armenia



This knowledge was obtained as a result of the installation of the metering and control equipment and resulted from the insufficient heat energy received from the supplier.

The tariff for heat energy in the 2002-2003 heating season (120 days) was set by the National Monopoly Regulatory Commission and reduced by a 57.25% subsidy by the Municipality of Gyumri. The resulting final tariff was:

- 1,100 AMD per 1 m<sup>2</sup>, or
- 5.20 AMD per 1 kWh.

The total heated living space of the building is 645 m<sup>2</sup>. In the case of billing for expected services provided based on meters squared, the charges would amount to 615,300.00 AMD for the entire heating season of 104 days. The actual fee for the whole season based on the readings of the installed equipment was 438,300.00 AMD. The difference between the bills based on meters squared calculation and the consumption-based fee was 177,000.00 AMD (~ US \$304).

### LESSONS LEARNED

Large temperature variations were recorded in the apartments of both buildings. This variation depended on the technical condition of the internal heat supply system and the location of the apartments in the building. Lower temperatures were recorded in all of the apartments on the first floor of the building. The distribution of heat started from the upper stories through a single-pipe vertical system: In this case the apartments on upper stories are heated better than those on lower stories.

Other factors, which contributed to variation of monitored temperatures, were:

- Modification of the internal heat supply system (i.e. pipes, enlargement of heated space, in particular the incorporation of

balconies into apartment space) by the residents.

- Inefficient convector heaters with serious technical imperfections installed in some apartments of the buildings.
- Poor state of internal heat supply networks.
- Poor weatherization of the apartments and open balconies in some apartments.

### BENEFITS FOR HOUSEHOLDS TO MEET ENERGY NEEDS

As a result of these two projects it became evident that in Yerevan, the actual quantity of heat supply did not exceed 60 percent of the normative requirements, whereas in Gyumri it was 70 percent.

Taking into consideration the fact that heat was undersupplied to both of the buildings, it is not possible to get an estimate of energy savings achieved from the installation and use of control and metering equipment. Nevertheless, based on the meter readings, the residents were able to achieve significant financial savings because billing was now based on actual consumption.

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