# Ukraine Case Studies

**Introduction:** Like Russia, Ukraine has tremendous potential to increase the efficiency of its buildings and urban infrastructure. Unlike Russia, Ukraine has too few energy resources. Ukraine faces some difficult choices because it must import most of the natural gas it uses to heat its cities. Every cubic meter of gas imported from Russia hurts Ukraine's balance of payments and increases its debt to its northern neighbor, and as a result the central and regional governments are telling the cities to do what they can to reduce gas consumption and improve efficiency.

For this reason, many cities have made concerted efforts to reduce energy waste. The problem, however, is the same in every city in the region – a lack of money and expertise to identify and implement efficiency projects. Because it is difficult for heat and water utilities in Ukraine to recover their costs through revenues, many of the most innovative programs have looked at increasing billing collection and redesigning tariffs to increase revenues. If all district heating companies in Ukraine were able to recover their costs and even make a profit, banks would be more willing to provide loans that could finance improvements to reduce the large level of energy losses.

What follows below are descriptions of the best practice efforts in Ukrainian cities to improve energy efficiency. The objective of identifying and describing these programs is to replicate efforts in other cities in Ukraine that can happen without donor funding. These programs will be described in training seminars with members of the Association of Ukrainian Cities, workshops that provide cities with tools to replicate these innovations. If some cities can implement these changes, most other cities may be able to do so as well. The results would be an improvement in energy efficiency in cities across the nation, better comfort in buildings that today have too little heat, a reduction in natural gas imports from Russia and greater energy security for Ukraine.

Some of these innovations – which will provide some of the tools to be provided in municipal training – include:

- **Kiev:** Improvements in billing for district heating that help increase revenue collection for heat suppliers, thus enabling the city to take debt to finance energy efficiency – specifically from the World Bank.

- **Ivano-Frankivsk:** Tariff reforms that encourage consumers to pay heat bills and increase the financial stability of the heat supplier; institutional changes in the city government to enforce energy consumption limits in public buildings; financial incentives to install heat meters.

- **Lviv:** Implementation of an energy accounting system that help to identify buildings with unusually high levels of energy waste and help prioritize efficiency investments; draft of local decrees to encourage energy efficiency; financial incentives to install meters; contractual reforms between heat suppliers, housing maintenance companies and consumers to enforce payments, which encourage metered residents/public buildings to save energy.

- **Rivne:** Direct billing of customers, reforms in the payment of heat subsidies and creation of a municipal energy service company (ESCO).

# Kiev

Kiev is the capital and the largest city in Ukraine, with the population of about 2.6 million. The major utility is the joint-stock company Kievenergo, covering the city's entire electricity demand and 75% of its heat demand. Half of the company is owned by the state, with 12.7 percent owned by the municipality and the rest being privately owned (including by non-residents).

Kievenergo owns and operates combined heat and power plants, heat-only boiler plants, electric transmission and distribution infrastructure and the heat networks. All electricity consumers are billed directly by the company based on metered consumption. Some heat energy users (commercial, industrial, some public and residential) are billed directly while heat supply to most residents is contracted through municipal housing maintenance organizations. There is an on-going process of heat meters installation and a shift from design-based to meter-based billing.

Although both Kievenergo and the municipality have their own quite significant financial resources, they were not enough to finance large-scale energy efficiency improvements. Thus, the World Bank provided two loans to finance supply and demand side energy efficiency: a $200 million loan to Kievenergo for district heating system rehabilitation, signed in October 1998 and ratified by the Parliament in March 1999; and an $18.3 million loan to the city for energy efficiency in public buildings, signed in April 2000 and ratified in July 2000.[1] Kievenergo and the city allocated $45 million and $10.1 million (20% and 33% of respective projects cost). The loans provided the impetus for reforming communal heat supply. The loan either required or led to the following:

- Increase in heat tariffs to the level of full cost-recovery;
- Reduction of cross-subsidies across different consumer categories;
- Shift to consumption-based billing through mass-scale installation of heat meters;
- Improvement of payment discipline through elimination of past arrears and timely settlement of new heat bills by the municipality;
- Improvement in the municipal subsidies accounting system.

## Tariffs

Residential tariff increase is a major socially-difficult problem for municipalities. Heat tariff dynamics for the main consumer categories in Kiev over the recent years is provided in the following table.

[1] The World Bank approval was only possible because of the good financial state of municipal budget and Kievenergo. That was only possible because of a new law adopted known as "The Law On the Capital of Ukraine" which enabled Kiev to keep 50% of locally collected taxes. Two ministries (Health and Education) were initially considered for the same Bank loan but could not confirm their co-financing due to the state budget uncertainty. This fact supports the notion that if urban infrastructure can be improved much more quickly if cities are allowed to raise taxes locally and have more control over their local budgets.

| Consumer category | Heat tariff, Hr/Gcal (without VAT 20%) | | |
|---|---|---|---|
| | as of September 1, 1997 | as of January 1, 1999 | as of November 1, 2000 |
| Residential | 31,70 | 31,70 | 44,60 |
| Budgetary | 40,14 | 52,00 | 57,50 |
| Industrial | 53,50 | 70,00 | 70,00 |

As of December, 2001: US$1 = 5.34 Hr (hryvna)

The latest tariff change brought residential and public sector tariffs closer to the industrial tariffs and therefore reduced the level of cross-subsidy between consumer categories. Because residential tariffs rose by 40 percent, a public awareness campaign was conducted, explaining the need to reform residential tariffs that were kept unchanged since 1996. At the same time, a significant factor is the current subsidy system, which limits total housing and utility payments for households to 20% of their family budgets. The difference between this limit and actual bills is covered by the municipality.

The public awareness campaign included advertisements in local newspapers and commercials played on TV and radio. The city aimed to explain the dynamics of fuel prices and inflation rates, as well as efforts of heat suppliers and the city to reduce production costs and maintain the lowest possible tariffs. The ads explained that the deterioration of a heat supplier's financial state leads to an inability to purchase enough fuel and impacts the level of service. The ads also emphasized that the tariff increase would not affect low-income households receiving subsidies for housing and communal services.

**Billing**

In 1998, the municipality changed the system of billing the population for housing and utility services. Before 1998, the bills in city-owned apartment buildings (the majority of housing stock in the city) were issued and monthly payments collected by more that 200 municipal housing maintenance organizations (called ZhEK's). Since 1998, the reform established a single billing and accounting center with an interim account for residential payments and subsidies. The center maintains four databases:

- Database of basic information for residential bill calculation (800,000 entries updated monthly based on information from ZhEK's;
- Database of utilities and communal services suppliers (more than 280 suppliers updated regularly);
- Database of banks authorized to receive payments for utility and housing services (40 banks, updated at the moment of contract approval);
- Database of Kiev city inhabitants receiving the subsidy for housing and utility services (updated monthly based on the information from district subsidy departments).

Every day the payments and subsidies at the interim account are split and transferred to each supplier of services. Introduction of this system made possible the following:

- obtain timely, updated and fully reliable information about the status of residential bills and subsidies payments;
- accurately allocate the subsidies;
- simplify billing calculation process and settlements of bills with service providers;
- reduce the preparation time and improve the quality of decision-making regarding housing and communal issues.

Before 1997, bill collection was less than 70 percent. As a result of this billing and accounting system operation, residential payments collection rate increased up to 82% in 1999 and 85% in 2000. ***The system is considered one of the best in Ukraine and is recommended by the State Committee on Construction and Housing Policy for introduction in other Ukrainian cities.*** In fact, this billing methodology has been already replicated in Vasylkiv (rayon capital in the Kiev oblast) and Chervonograd in the Lviv oblast.

**Lessons/Recommendations:** The following measures realized in Kiev could be recommended for further replication:

- Introduction of heat tariffs providing cost recovery and generating investment funds for supplier;
- Improvement of billing system, with elimination of numerous intermediaries and establishment of a single billing center;
- Enabling cities to keep more of their revenues and giving them more ability to raise revenues will encourage borrowing for municipal infrastructure improvements.

# Ivano-Frankivsk

The City of Ivano-Frankivsk, a regional capital in Western Ukraine has made two significant moves in reforming local utility tariffs. The first one provided tariff incentives for end-user installation of water meters, and the second one introduced a two-tier tariff for district heat. The city has also adopted an administrative approach to reducing energy consumption in public buildings, creating a new department to improve energy management.

**Tariff incentives for meter installation**

On January 1, 2001, the city introduced different hot and cold water tariffs for metered and unmetered consumption. The tariffs favor metered consumers as shown in the following table:

| | Tariff, Hr/m3 | | |
|---|---|---|---|
| | Hot water | | Cold water |
| | Heating season | Summer season | |
| Consumers with meters | 4.06 | 2.79 | 0.41 |
| Consumers without meters | 4.27 | 2.92 | 0.46 |

Production cost for hot water is 3.39 Hr/$m^3$ during heating season and 2.31 Hr/$m^3$ during the rest of the year. Existing tariffs provide full cost-recovery, with unmetered consumers actually subsidizing the metered ones by paying higher price for the water consumed. This provided a strong incentive to meter installation. Over the period of existence of these "discriminative" tariffs, the number of hot water meters increased from 4,675 as of January 1, 2001 up to 10,506 as of November 1, 2001 – an increase of 125 percent. Currently, 89 percent of public buildings and 26 percent of residential consumers are equipped with hot water meters (which of course encourages conservation because consumers are charged for what they use).

The combined effect of these factors has led to a 9 percent decline in budget expenditures for hot water supply to public buildings. The introduction of tariff incentives was accompanied by a public awareness campaign in local mass media, including special programs and discussions on local TV and radio, as well as articles in local newspapers.

**Two-tier tariff for district heat**

On January 1, 2001, the district heating company introduced a two-tier heating tariff for residential consumers and public buildings. Originally, there was only one consumption-based tariff set at 59.75 Hr/Gcal. Today, there is a separate payment for peak demand use (or demand charge) set at Hr 47,844.23 per 1 Gcal/h of "connected heat load." This is in addition to the charge for each gigacalorie consumed (40.82 Hr/Gcal). In buildings with no heat meter, there is a flat rate of 0.32 Hr/$m^2$/month (demand charge throughout the year) and 1.12 Hr/$m^2$/month (payments for heat energy during heating season).

So how does this work? If a school has a typical heating load of 0.5 Gcal/hour then with the existing demand charge at Hr 47,844.23 per 1 Gcal/h, its annual bill for connected load will be 0.5*47,844.23=23,922.12 Hr. It would pay this amount in 12 monthly installments based on the

design peak demand . If the school installed efficiency measures that reduced its peak demand below the design value of 0.5 Gcal/h and had this lower peak level certified by a licensed energy auditor, the demand charge would be reduced by the same proportion. If the actual load after efficiency improvement were .45 Gcal/h, the demand charge would then be Hr 21,530 or 10 percent lower.

The problem is that it is much easier and simpler to save on consumption-reducing measures that do not impact peak demand (such regulation with evening and weekend temperature setbacks). Measures that reduce peak demand are more costly (insulation, ventilation heat recovery, weatherization etc.). In addition, the school could try and simply lower the temperature, but it has to comply with sanitary norms.

Although this is technically a demand charge because the level is based on peak demand, it can also be called a network or connection charge because it is also paid during the summer (although the level is much lower) The charge covers a fixed component of the production cost that includes make-up water, materials, depreciation, salaries, repairs, and a smaller part of fuel and electricity costs. (The tariff for actual heat consumption covers the variable component of the production costs, and corresponds to the cost of fuel and electricity consumed at boiler plants. This charge, of course is only applied during the heating season).

Under the new two-tier tariff for residential consumers in Ivano-Frankivsk, the district heating company receives about 61% of its revenue from the consumption charge and about 31% from the demand charge. This tariff reform carried out in Ivano-Frankivsk is the first such experience in Ukraine and all the impacts need more time to manifest themselves. But so far, the following seems to be clear:

1. The demand charge provides an incentive to end-users to reduce their peak demand (insulate buildings, weatherize windows and doors to reduce infiltration losses, introduce heat recovery for ventilation in public buildings etc.) and thus stimulates energy saving efforts.

2. The two-tier tariff resolves the problem of having all the payments come in during the heating season. The demand charge is constant throughout the year and thus lowers the consumption fees. This means consumers pay less during the peak season, which eases the financial burden for them, and spreads some of the cost across the entire year. The system also provides revenues for summer maintenance. This option is better than simply spreading the costs of entire heat bills across the entire year because a) each monthly bill would be higher (it is harder to convince people to pay their heat bills in July) and b) spreading the entire heat bill across the year would not work for metered customers. The two-tier tariff is a middle-road, where the summer payments are low enough that consumers are willing to pay.

All of this means that the two-tier tariff allows the heat supplier to get revenues which more closely correspond to its expenditures throughout the year – thus improving the utility's financial stability and level of service. City officials believe that this helps explain the fact that payments have increased: before the introduction of the two-tier tariff, the collection rate in the residential sector was 76.2%; based on nine months of 2001 data, the rate rose to 89.1%.

3. Higher bills during the heating season have also resulted in a re-distribution of the amount of subsidies over the year, and subsidies assignment in heating season has increased by a factor 2.4. Therefore, the bulk of payments are now coming during the heating season when the heat supplier needs them most to finance fuel purchases.

**Energy Efficiency in Public Buildings**

In 1998, the city administration created a Department for Rational Usage of Energy Resources for the purpose of reducing expenses on energy. The department focused its work on two directions: 1) introducing heat metering, and 2) developing and enforcing limits for energy consumption by municipal facilities.

The limits for heat energy are set for schools, hospitals and other public buildings based on building's thermal performance and energy metering data and expressed in physical units (Gcal/year) in connection with weather conditions (number of heating degree-days). The limits also exist for hot and cold water as well as for electricity consumption. However, heat receives the most attention because it accounts for 60 percent of a typical public building's energy costs. ***The department also sets limits for the municipal district heating company in terms of gas consumption per Gcal of heat produced thus requiring a certain level of production efficiency from the district heating company.***

Enforcement of energy consumption limits is done by municipal facility managers, and the effort has yielded some impressive results. Almost all municipal facilities have heat and water meters. In addition, energy consumption in 2000 was 30% less than in 1998 (although this is in part because of recently warm winters that have lower energy needs).

To encourage larger and more comprehensive investments in energy efficiency, the city issued a special resolution providing economic incentives to energy saving and securing financing for efficiency improvements. The resolution is effective as of January 1, 2001, and states that if a municipal building (e.g. school) has consumed less energy than required by the limits, 30 percent of the savings can be paid as bonuses to the school's staff. The remaining 70 percent of the savings from all schools are pooled and may be used by the Department of Education to finance energy efficiency in some of its schools.

Unfortunately, this system has not been implemented because the municipal Department of Finance uses the energy cost savings for other city's needs – the bonuses and efficiency financing as planned by the resolution have not materialized. More importantly, the next year's limits for energy consumption in schools are likely to be reduced according to the savings achieved. This is the case in most cities in Ukraine and across the region, and it is a major disincentive towards better energy management. Why would a school invest in energy efficiency if its administrators knew that their budget would be reduced next year because their energy expenses were lower. From the government's point of view, energy efficiency means the school can do more with less, but for the school, that energy money could be used for textbooks or computers.

A similar resolution to allow public buildings to keep their energy savings was passed in Lviv, but was not implemented because of one very critical factor: no procedures were ever put in place that specified how energy and cost savings would be calculated. The effort is now underway to develop these procedures to make clear how building managers can measure, verify and report actual savings from energy efficiency investments.

## Lviv

The City of Lviv is a regional capital located near the western border of Ukraine. Over the last two years the city has encouraged the installation of heat meters in the residential sector. A municipal regulation directs the district heating company to provide a 10% discount (initially it was 20%) on existing residential heat tariffs for buildings where heat meters are installed using the occupants' own funds. The discount is effective for one year starting from the moment of installation. The district heating company's losses because of the discount are not reimbursed by the municipality. The same discount also exists in respect to apartment-level hot water meters installation.

The discount provides a strong incentive to install meter, ensuring a payback period of no more than 1-2 years. What normally happens is that an initial group of 3-4 apartment owners explains the benefits to other inhabitants and collects funds for a master heat meter. After the meter is installed, it is transferred to the balance sheet of local ZhEK (housing maintenance organization), which assumes responsibility for the maintenance and operation of the meter. This transfer procedure originally required the payment of a tax by the ZhEK, but the city canceled this payment to encourage the support and involvement of ZhEK's.

As a result of this incentive, the number of meters in the residential sector is rapidly growing. Currently, 35 percent of apartment buildings are already equipped with heat meters, a figure that will likely grow to at least 45 percent by early 2002. The number of apartment-level hot water meters is more than 37,000 and is also growing.

While metering for end-users gets the most attention, mass-metering at points in the supply systems for heat and water is also very beneficial. On the supply side, mass-scale installation of meters provides a clearer picture of the system operation together with incentives to reduction of heat losses and overall improvement of district heating efficiency. Installation of meters also benefits heat suppliers because it requires, as an accompanying measure, installation of valves and filters which reduce water losses and improve water quality.

### Payments collection reform in municipal district heating

As in Kiev, payments collection through ZhEKs was a standard approach but became unattractive to the utilities because of delays in transferring payments and excessive fees taken by the ZhEKs (along with some outright corruption). Kiev abandoned the use of ZhEKs as intermediaries for heat tariff collection, but Lviv went the other way. Lviv instituted much stricter contract arrangements between the district heating company and ZhEK with full responsibility of the latter for full and timely transfer of funds. As part of this, the heat supplier

can switch off heat to buildings where ZhEKs are unable to collect substantial levels of heat payments. Generally, delays in hot water payment can lead to immediate cut off, and for heat, if overall payment rates in an apartment building fall below 75 percent, the district heating company will consider cutting off the building. Because the payment rates are generally pretty good, this is not usually a problem because on a large-scale, cutting off a building would cause social unrest. New arrangements in settlements for heat supply include the following features:

- Contracts are concluded with individual buildings, with heat energy sold to ZhEKs at wholesale price;
- ZhEKs sell heat energy to building occupants at higher retail prices, with the markup covering their costs for operation and maintenance of internal building heating system;
- The ZhEK is responsible for payments collection in full and on time; all non-payment problems are to be solved between ZhEKs and apartment owners.

In regard to payments collection, ZhEKs are closer to building occupants and have more information about households' ability to pay. Providing for everyday building needs, ZhEKs have a greater capacity to encourage payment discipline on persistent non-payers. Having ZhEKs as a buffer between heat utilities building occupants, the district heating companies have started to switch off heat supply to building with high levels of non-payment. These measures have significantly impacted the payments collection level, which have risen from 65-70% to over 90% of current bills (although past arrears still remain).

**Energy Accounting System in City Schools**

The energy accounting system in Lviv provides city managers with up-to-date information useful for decisions on energy efficiency investments. The software includes a special-purpose database developed by the Alliance to Save Energy and a data collection procedure introduced by the local authorities for monitoring energy data of city schools' buildings.[2] The Alliance installed the database on computers in the Education Department and provided training to its users. The first version of the database was released in 1998, and the second upgraded version in 2000.

The database ranks schools by energy intensity, as measured by heat use per unit of area (square meters). As a result, the city has now a list of schools that are the most energy intensive – energy "hot spots" – buildings with disproportionately high levels of energy waste. Based on readings from the heat meter, school size and indoor/outdoor temperature, the database calculates the amount of energy (calories) that is required to raise one unit of area one degree. While there may be many reasons for a high level of energy intensity, the experience generally shows that the higher the energy intensity, the more likely the school is to have significant and cost-effective energy efficiency potential.

[2] The Alliance provides its energy accounting software to municipalities and other non-profit institutions at no charge.

Schools that ranked high in terms of energy intensity were examined more closely, and the database proved useful for the city in developing a project proposal to retrofit five schools. This project is now pending before the Western Ukrainian Commercial Bank. The efficiency measures eliminating these factors are very cost-effective and are estimated to have paybacks less than 3-4 years.

The software was developed using Microsoft Access and consists of four basic modules:

- module which keeps general information about the school;
- data entering module;
- data analysis module;
- interface for importing and exporting data from the database.

The database provides various types of analysis within the certain period of monitoring for the group of buildings with respect to its consumption of any kind of resource (heat, electricity, natural gas, hot and cold water). The software includes the algorithms capable of ranking buildings by the following indicators:

- energy use per unit of square area;
- deviation of building's actual thermal comfort from standard levels;
- cost of resource consumption per capita or per square meter based on bills from utilities;
- cost of all utilities based on bills;
- cost of all utilities per capita or per square meter based on bills with breakdown of involved utility services.

To introduce energy accounting and energy management in city's schools, two orders were issued by the Director of the Lviv City Education Department. The Director issued Order #229, requiring the development of an energy management plan for all schools in Lviv. The order requires every school in the city to have a technician looking at energy-saving opportunities. After these initial "audits", the project opportunities are placed into an overall plan, and the Education Department will prioritize the projects based on need and cost. The overall network of engineers and school technicians reassigned to this task totals 120.

The Department also set up a working group to develop a common methodology for the energy accounting system in all schools. The database was adjusted according to the standards designed by the working group. The data collection procedure was introduced in some schools, with the goal of spreading this to all schools – providing for storing daily building-level data and updating the database information on a quarterly basis.

**Other Features of the Effort in Lviv**

Much of the work done in Lviv was funded by donors, particularly USAID. The energy database is a good example, but qualifies as replicable because any city in Ukraine can use it. In December of 2001, the City of Lutsk agreed to implement a similar energy accounting system.

Other USAID-funded work included the implementation of demonstration projects (implemented by the Alliance to Save Energy). The projects were completed in schools and residential buildings and are noteworthy for several reasons:

**1. Technology:** The projects focused on installation of weatherization (weatherstripping, window repair, caulking, door seals, etc.) and on building level controls. The control technology is particularly important because the controls ***automatically reduce heat use during the evenings and weekends. Because schools and other public buildings are hooked up to the same heating system as residences, the heat is on 24 hours a day, seven days a week during the heating season. By reducing heat use from 168 hours a week to 35, there is a major reduction in energy use.*** This technology, not common in Ukraine, has major market potential. The total project in the school reduced energy use by more than a third, adjusted for weather factors.[3]

Because Lviv has a centralized heating system, another benefit of this work is that ***saving heat in one building can improve heat flow and comfort in chronically under-heated buildings further down the system, resulting in a circuit-wide improvement in energy management.*** It was for this reason that the district heating company is installing controls in more public buildings with its own funding. And just recently, the city signed a contract to weatherize a hospital.

These results generated a high level of interest among city officials, who recognized that energy efficiency was perhaps the only way to relieve the burden on the local budget while also *improving* the quality of municipal services. The Lviv school alone is saving $5,000 per year, and has encouraged the city to seek out a loan for additional school retrofits. One of the benefits the city is trying to replicate is the comfort improvement. The school's indoor temperature increased above sanitary norms while also reducing actual energy use. Health related absences decreased by 10-20 percent because the classrooms were more comfortable.

Finally, the automatic control technologies we used were available on the local market, but they were very expensive. The Alliance paid more than $10,000 for one control system, but when a Ukrainian engineer was hired, he was able to modify the control system using local parts and labor, which reduced the cost by 70 percent – with no major impact on performance. Now these control systems are much more affordable to Ukrainian clients.

**2. Private Sector Development:** As part of the USAID program, the Alliance aimed to stimulate a local market for energy services that could be satisfied by local businesses – the hope being that energy efficiency could also generate much-needed jobs. One of the local businesses trained was a company called Universe; Polish contractors provided instruction in the "how-to" of weatherization, giving the Ukrainians some tools and instructions on how to obtain the weatherization materials from Poland.

The Universe Company has developed and is expanding its energy efficiency business. Since the training and demonstration, they have weatherized 1,000 windows, installed 15 heat meters

[3] At a second pilot site -- a 26-unit residential building -- low-cost weatherization upgrades for windows and doors in the individual apartment units reduced the heat consumption by 16 percent.

and just installed their first control system – all for Ukrainian clients. They have seven full-time people, and their overall market is growing.

As mentioned above, the city is working on getting a loan from a bank to rehabilitate several schools, with the Education Department using the energy database as a reference tool. One barrier is the high-cost of finance with dollar loans ranging from 12 to 16 percent. Local currency loans have much higher interest rates. Although cities probably have more difficulty than just about any borrower paying back dollar loans, Lviv will seek a hard-currency loan. The reason is that the main fuel the city uses for heat is gas, which is priced now at world market levels. So the savings it would achieve would essentially be equal to hard currency, a factor that cities should consider when seeking lower interest, hard-currency loans.

**Conclusion**: The next step for Lviv will be to create procedures that specify how energy and cost savings would be calculated. The effort is now underway to develop these procedures to make clear how building managers can measure, verify and report actual savings from energy efficiency investments. With an agreed-upon way to verify energy savings, the city can then allow schools and other public facilities to keep the financing savings they generate from energy efficiency, removing a major barrier. A draft methodology, which uses as a model other monitoring and verification techniques, is now available from the Alliance. If passed by the Lviv City Executive Committee (where it is now pending), it could be a major contribution to energy efficiency in Ukrainian cities.

## Rivne

The City of Rivne, a regional capital in Northwest Ukraine, has implemented measures to increase billing collection for payments of housing and utility services. Rivne has introduced direct billing and tied residential subsidies to full and timely payments on utility bills. Progress in payments collection and the improved financial state of the district heating company allowed Rivne to become a pilot city for a UNDP/GEF district heating efficiency investment project.

In 1998, the Rivne mayor created the Municipal Comprehensive Energy Efficiency Program for 1999-2000. Since 1998 the municipal budget has been investing up to 1 million Hr. (US$180,000) in district heating rehabilitation. The overall program reduced heat consumption by 5-7% in 1999 – a total of 45,700 gigacalories.

### Direct billing by heat supplier

Before the shift to direct billing, the residential payments for housing and utility services (including heat supply) were collected by ZhEK's (municipal housing maintenance organizations). Collected payments were supposed to be split among service providers and transferred to them in proportion to actual collection rate. In practice, however, ZhEK's reimbursed their own costs and only after that, the remainder was split and transferred to other service providers. This led to significant delays and underpayment of utilities, including the heat supplier.

The local district heating company Kommunenergia gave up using ZhEK's as intermediaries and started collecting payments by itself. In 1999 it started to bill each consumer directly, issuing and delivering individual bills for each household. To collect payments, the company set up seven payment reception offices throughout the city. In addition, heat bills can be paid in about 50 offices of all city banks.

Residential heat payments are based on two schemes: 1) bank transfer from customer's account to the district heating company; 2) based on the previously signed agreements consumers' payments are collected by the relative agencies of the district heating companies. To improve payment collection heat bills are monthly sent out to all consumers. In addition, the city has aimed to eliminate cross subsidies for various consumer groups and increase heat tariffs to ensure profitable operation of the district heating companies.

Bills issued to the population include the actual cost of heating and hot water and the amount of subsidy allocated to each household. Bills are calculated using the information from the customers' database maintained by the district heating company. Information on housing and utility subsidies is provided by the municipal department of subsidies, which calculates and assigns them.

As a result of direct billing and payments collection, the company now receives residential payments all at once and in full. Together with what is called "conditioned subsidy allocation" (see below), direct billing significantly contributed to improvement of the Kommunenergia's financial state.

The elimination of ZhEK's as negligent intermediaries is considered to be a good measure in streamlining financial flows. However, this can be recommended only as a first step, because if every service provider (heat, water and canalization, electricity, gas, building maintenance etc.) starts issuing its own bills or pay-books at different places, it would create difficulties both for the population and subsidy departments. The second step should be setting up a single billing center like the one operating in Kiev. The utilities and service providers, however, must be convinced that joining such a scheme will be fair to them and ensure the quick transfer of collected payments.

**Conditioned subsidy allocation**

The existing subsidy allocation system in Ukraine provides support to low-income households and is supposed to cover communal service costs for families whose bills exceed 20 percent of total family income (15 percent for most underpaid families). This means that households pay up to 20 percent of income and then are subsidized. To get the subsidy, an application (with documentation proving the level of family income) is submitted every three months to a local department.

To improve payments discipline and increase the collection rate, city and district heating company officials agreed to require full and timely payments for current housing and utility bills as a pre-requisite for subsidy assignment. If the household has communal service debts, the

subsidy application is declined and the household starts to be billed for the full cost of provided services. If debt is repaid, the subsidy resumes.

The introduction of "conditioned subsidy allocation" greatly increased the collection rate for subsidized households. ***The number of residential sector debtors reduced from 22,729 in 1999 to 18,446 in 2000 and to 15,084 in 2001.*** At the same time, district heating company's revenues from the residential sector increased in the following way:

- 1999: billed (without subsidies) Hr 13,736,600, collected Hr 8,158,800 (59%);
- 2000: billed (without subsidies) Hr 16,191,000, collected Hr 13,122,400 (81%);
- 2001: billed (without subsidies) Hr 15,043,200, collected Hr 14,895,600 (99% -- 10 months' data).[4]

Of course, this approach provides an incentive only to subsidized households. It does not impact (generally wealthier) families who do not receive subsidies. To deal with the latter debtors, lawsuits on payment arrears are prepared and sent to court. According to the court decision, compulsory recovery of costs and penalties can then be enforced.

**UNDP/GEF district heating efficiency project**

In January 2000, the State Committee for Energy Conservation (SCEC) together with the United Nations Development Program (UNDP) applied for a grant from the Global Environment Facility (GEF) aimed at reducing greenhouse gas emissions by district heating systems in medium and large Ukrainian cities. To select a pilot city for the project, UNDP conducted a competitive selection procedure based on the following criteria:

- funding available in municipal budgets for energy efficiency investments – GEF wanted to ensure local co-financing from the city and SCEC;
- financial state of the district heating company and local budget – in order to potentially attract external investors to finance project implementation;
- having a typical district heating system (technically and institutionally) – to help promote replicability across the country.

In March 2000, Rivne won the competition, in large part because:

- The city allocated Hr 1 million every year for energy efficiency projects.
- Rivne's district heating company had the lowest level of debt (both from consumers and to fuel suppliers) both in absolute values and per Gcal/h of the company's installed heating capacity. Rivne also had one of the highest overall collection rates, including the highest rate

[4] While it may appear that conditioned allocation hurts the poor and most vulnerable, the following must be kept in mind. 1) For consumers who do not pay heat bills, their service is not cut off. It is technically not possible to cut off individual households on a typical district heating system in Ukraine. The level of debt simply rises. 2) In many respects, the 20 percent of income limit does not actually reach the poor. The more people earn, the more wasteful they often become. Thus, many residents qualify for the subsidy but are not actually considered poor. A World Bank survey found that in 1996, only 28 percent of Ukrainian households that reported receiving a housing allowance were actually below the (relative) poverty line.

of payment in cash (in other cities, non-cash payments such as barter and mutual offsets was much more common).

- Rivne has a very typical district heating system, with a range of boiler plants represented. There is a two-pipe heat transmission system with group and individual substations. The ownership structure is also typical for Ukraine.
- Rivne already had a well-developed municipal program for energy efficiency. The program called for an investment level of about $450,000 for modernizing the heat supply system. The program included shutting down inefficient boiler plants and connecting their load to more efficient plants, replacing a number of obsolete boilers by more efficient ones, and replacing some heat transmission pipes with pre-insulated ones. On the demand side, the city aimed to install heat meters and controls for public sector consumers.

Without question, Rivne's efforts to improve cash collection enabled it to have the money to pay for these improvements and in the end, win the GEF project.

The total cost of the GEF investment program is approximately $24 million. UNDP/GEF plans to provide $4 million of grant financing for its implementation. The remaining costs are to be covered by local contributions, equity investors' financing and bank loans. The grant will help cover project development costs and finance some of the less attractive, longer pay-back investments, leaving the better and less risky projects for private investors.

The GEF is aiming to establish a municipal energy service company (ESCO). Operating under energy performance contracts, the ESCO would prepare, implement and finance all investments in the district heating system, as well as in municipal buildings and other energy consumers.

The ESCO will likely start as a communal enterprise and be transformed into a joint-stock company with local and private investor ownership – including Western investment. In addition to equity, the ESCO will hopefully attract debt financing from international financial institutions, foreign and Ukrainian commercial banks. If successful, this would be the first of such projects in Ukraine or any former Soviet country. Whether it works remains to be seen, but the most important ingredient is there – the city is collecting revenues for its municipal services. Without that, there is no way to attract investment.

## Conclusion: Replicating the Results in Other Cities

Why is MUNEE cataloging these success stories? Because what cities have done in Ukraine and what is replicable without donor financing can convince other cities to do the same. From here, MUNEE will work with the Association of Ukrainian Cities (AUC) to provide a "basket of tools and ideas" from which cities can choose what works for them. These case studies in Ukraine (and others in Russia) show some of the following reforms are possible and can have an impact:

- Innovations in billing and collection methods
- Tariff redesigns and subsidy reforms
- Incentives to install heat and water meters – both on the building level and in individual apartments

- Municipal software and energy accounting systems
- Reforms in the relationship between the heating company, housing maintenance company and consumer
- Developing methodologies for public-sector buildings keep the energy savings they generate
- Experience with financing from local sources
- Showing the benefits of technologies that save energy, particularly controls that regulate heat in public buildings during unoccupied times of the day and week.

With this basket of tools, MUNEE can go around to cities and AUC events and provide cities with these tools and for those that are interested, assist in implementing these tools. The fact that these approaches have been tried by other cities means local leaders do not have the excuse of saying it could never work in Ukraine. Already the Alliance is working to replicate some aspects of the Lviv program in six other "roll-out" cities. As with Lviv, the roll-out project aims to:

- Work with the city and train local technicians in identifying candidate city buildings where control systems and weatherization would generate the most savings (training includes designing technical specifications of the systems, issuing competitive tenders, installing the equipment, maintaining it and monitoring of the energy savings).
- Implement a demonstration project as a tool to educate and engage the highest levels of city government.
- Ask for a cost-share from the city of 50 percent to ensure local buy-in
- Build local businesses to do energy efficiency and stimulate a market that will last long after the Alliance's involvement is over.
- Set up an energy management database for the city to make *identifying* future projects easier (Lutsk already committed to developing an energy-accounting system).
- Identify sources of local and international finance for *implementing* future projects.

The six "roll-out" cities as we call them are Lutsk, Kharkiv, Khmelnitsky, Ternopil, Slavutych and Ivano-Frankivsk. Many of the control systems and other equipment were installed in the summer of 2001, so we have no data on the savings. But for all the buildings we do have data from last heating season, we achieved major savings – confirming the potential for energy efficiency exists everywhere in Ukraine:

- Ternopil, school # 3: Energy Savings of 29 % (equipped with control system),
- Ternopil, school # 13: Energy Savings of 35 % (weatherized and equipped with control system)
- Ivano-Frankivsk, school # 13: Energy Savings of 28 % (equipped with control system)
- Ivano-Frankivsk, school # 20: Energy Savings of 36 % (weatherized and equipped with control system)
- Lutsk, school # 10: Energy Savings of 26 % (equipped with control system),
- Lutsk, school # 19: Energy Savings of 34 % (weatherized and equipped with control system)
- Kharkiv, school # 24: Energy Savings of 41 % (insulation of basement ceiling and roof and equipped with control system).

- Kharkiv, school # 161: Energy Savings of 37 % (insulation of attic floor and equipped with control system).

We are also training local contractors all over Ukraine in controls and weatherization installation. This has been an important component in the roll-out cities. For example, the Alliance is working to expand and improve the services offered by private maintenance and management (PMM) companies in Lutsk and other cities. These PMM's sign contracts with multifamily buildings for everything from collecting garbage to fixing elevators. The PMM in Lutsk, a company called "MZK" is now adding weatherization, controls and metering devices to its range of services. In addition to Lutsk, we are working with and training the following companies:

- ESCO-Center (Slavutych): Controls and weatherization
- ESCO-West (Ivano-Frankivsk): Controls
- Comunbud company (Khmelnitskiy): Controls and weatherization
- Industrial&Financial Center (Kharkiv): Controls
- Universe, Kompleks ltd. and Soltic ltd (three companies in Lviv): Controls, weatherization and window replacement.
- "Obriy" Company (Ternopil): Energy management database and monitoring