



**USAID**  
FROM THE AMERICAN PEOPLE

**MUNICIPAL HEATING  
REFORM IN UKRAINE**

# MUNICIPAL HEATING REFORM PROJECT (MHR)

## **Municipal Energy Planning Practices (materials for dissemination)**

**June 2012**

This document was produced for review by the United States Agency for International Development (USAID).  
It was prepared by the Municipal Development Institute within the USAID Municipal Heating Reform Project in Ukraine.

# MUNICIPAL HEATING REFORM PROJECT (MHR)

## **Municipal Energy Planning Practices** **(materials for dissemination)**

ENERGY II IQC, TASK ORDER 9  
Contract: EPP-I-00-03-00006-00

June 2012

This document was made possible through support provided by the U.S. Agency for International Development. The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

## **History and structure of the Regional Training Center on Municipal Energy Planning “All-Ukrainian Charitable Organization “Municipal Development Institute”**

The Regional Training Center on Municipal Energy Planning “All-Ukrainian Charitable Organization “Municipal Development Institute” (RTC MDI) was created in March 2010 under the USAID Municipal Heating Reform in Ukraine Project (MHR). The structure of RTC MDI includes the following representatives of All-Ukrainian Charitable Organization “Municipal Development Institute”:

1. Ruslan Tormosov, head of RTC, candidate of science, associate professor with Kyiv National University of Building and Architecture, MDI Consultant in Business Planning and Social Communications.
2. Roman Zherdytsky, MDI Consultant in Financial Issues.
3. Anatoly Koliyenko, PhD in Technical Sciences, Professor with Poltava National Technical University, MDI Consultant in Technical Issues.
4. Sergiy Pokalitsyn, PhD in Technical Sciences, MDI Consultant in Technical Issues.

The above four specialists were trained in the framework European Methodology of Municipal Energy Planning by one of MHR sub-contractors – Center for Energy Efficiency “EnEffect” from Bulgaria. Specialists of RTC MDI prepared Municipal Energy Plans (MEPs) for six MHR Project partner-cities. The MEPs of Vinnytsia, Korosten, Lutsk and Chernigiv were considered and approved by local councils as a main document that would determine energy efficient development of municipalities for the nearest 4-5 years. MEPs of Rivne and Khmelnytsky are expected to be approved in July 2012.

### **Definition, goal, and description of a Municipal Energy Plan**

A Municipal Energy Plan is a key political document in the area of municipal energy management which, in the framework of established long-term priorities, determines the general policy of a local self-government in the domain of energy conservation for the medium planning term (4-5 years). It lays out medium-term goals of a municipality and describes goal achievement in detail. Thus, through implementation of a MEP a local self-government may have the following achievements:

- ***in the area of heat energy production and transportation***
  - creation of an environment in which a heating utility may attract long-term investments at minimum interest rate (first of all, loans from international financial institutions and lenders);
  - financing measures and projects which would allow improving investment attractiveness of municipal heating utilities;
  - taking part in negotiations with potential investors, providing certain guarantees to investors, undertaking part of risks or risk insurance costs, helping a heating utility with a liquid security.
- ***in the area of heat energy consumption***
  - creation of an environment for increasing efficient use of energy;
  - financing demonstration and pilot projects on thermal modernization of residential and public buildings;
  - creation of a favorable environment for turning energy efficiency efforts into a profitable business with the view of getting cheap loans for thermal modernization from international financial and lending institutions and with contributions from all interested stakeholders (residents, businessmen, etc.);
  - strengthening the community’s knowledge in the area of energy conservation.

All efforts of local authorities in the area of energy efficiency will be regular and well organized and based on a systematic approach and long-term planning. A Municipal Energy Plan is a key document which outlines a system approach of a local self-government in the long-term perspective, establishes strategic objectives, describes short-term tactical tasks, lists key actors of energy efficiency, and main directions of this process.

## **Methodology**

The RTC MDI used the framework European Municipal Energy Planning Methodology of EnEffect (Bulgaria). A considerable contribution of the RTC MDI specialists is that the given Methodology was tailored specifically for Ukrainian cities and further fine-tuned that is shown in the structure and content of relevant documents.

Municipal energy planning could be three-phased as follows:

### **Phase 1: Development of a concept of MEP (4 months).**

These four months were spent for:

Preparation and dissemination of a Motivation Letter – a special document which presents key goals and tasks of municipal energy planning, and describes the entire process and expected results of implementation of a MEP; and

Establishment of a Working Group that consisted of representatives of a municipality and aimed at training and joint work on a MEP. Introductory workshops were held for representatives of the Advisory Committee on Energy Efficiency and members of the Working Group. Participants of the workshops were presented the need and goal of a Municipal Energy Plan, process of municipal energy planning, questionnaires for collection of the required technical, financial, and statistical information. Persons responsible for collection of information per area were appointed.

Phase 1 resulted in preparation of the Concept of Municipal Energy Planning – a temporary milestone document of municipal energy planning. The Concept describes key strategic directions and decisions which are discussed and approved by the Working Group and the Advisory Committee, and representatives of other interested stakeholders.

Presently, a significant contribution of RTC MDI specialists into development of the Methodology of MEP could be as follows:

- Criteria and Requirements for Selection of Members of the Municipal Working Group – developed as a separate document;
- Requests for Data and Information for Development of Municipal Energy Plans of Pilot Cities – developed as a separate document with annexes;
- in addition to the Manual and presentations provided by EnEffect, RTC MDI specialists developed training and other materials which could form a basis for a Manual on Municipal Energy Planning revised to meet local requirements and conditions.

The Motivation Letter and the Concept of MEP are the documents which could serve as examples for similar documents for other Ukrainian cities.

Phase 1 is concluded by the 2<sup>nd</sup> Training Session on MEP where the Concept of MEP is presented and, following comments and proposals, approved.

### **Phase 2: Development of the first draft of the MEP (2-3 months).**

Following the 2<sup>nd</sup> Training Session on MEP, with all comments and proposed changes to the Concept of MEP considered, following data collection, processing and analysis, RTC MDI specialists developed and presented at special enlarged meetings of Working Groups the first draft of MEP. This document following comments and proposals from all stakeholders was revised and turned into a Final document called the Municipal Energy Plan.

The first draft of MEP was presented at the 3<sup>rd</sup> Final Training Session on MEP and provided for review by the Working Group and the Advisory Committee.

### **Phase 3: Preparation of the final package of documents and assistance to approval of the MEP (2 months).**

The MEP and its final package of documents were finalized based on all comments and proposals received from municipal energy planning players and presented at enlarged meetings of municipal Advisory Committees. Journalists were invited to those meetings, press-releases and short versions of the MEP prepared and disseminated. Thus, all stakeholders were informed and participating in finalizing the Municipal Energy Plan.

After all comments and proposals were considered, the revised MEPs were sent to local authorities who jointly with RTC MDI prepared MEPs for consideration by local city councils. Some municipalities invited RTC MDI specialists to participate in a meeting of a local city council where a MEP was approved.

A significant contribution of RTC MDI specialists into development of the Methodology during Phase 2 and Phase 3 could be:

- improvement of the structure and contents of a Municipal Energy Plan and annexes;
- Methodology of Municipal Energy Planning updated with additional studies which strengthened the integrity and efficiency of MEP. Those studies were: analysis of potential and accessibility of alternative and renewable sources of energy, a methodology of analysis of a municipality based on five functions according to which a local self-government impacts on heat energy production and consumption, analysis of financial, institutional, and technical restrictions as regards municipal energy planning, and others;
- creation of a new for Ukraine system of identification of goals and tasks which are realistic, accessible, flexible, measurable and consistent. Each goal and task has a system of indicators, with their present values and forecasted values. This approach allows for tracking the effectiveness of implementation of a MEP at any time, identification of bottlenecks, streamlining efforts and, thus, increasing implementation effectiveness and reliability;
- expanding the list of projects proposed by auditors at the expense of the consistent horizontal and innovation projects which were developed by RTC MDI specialists;
- application of program performance budgeting for the development of the investment program of MEP, and new approaches to ranking investment projects;
- justification of a series of "soft" measures mandatory for implementation as a separate targeted program which would support efficiency of a local MEP, especially in the short-term planning perspective;
- preparation of a separate program for MEP implementation and monitoring which would raise the efficiency of MEP;
- lobbying preparation for MEP approval by a local city council that would guarantee approval of MEPs in the cities which RTC MDI worked with.

### **A list of prepared documents**

A list of documents and their contents were regularly reviewed and updated in course of preparation of local MEPs in the cities which RTC MDI worked with.

For the third "wave" cities such as Rivne and Khmelnytsky, the final structure and a final list of documents were completed. Those were:

- working documents (the Motivation Letter, the Concept of MEP, the Explanation Letter to MEP) are the documents which shall increase efficiency of development of the Municipal Energy Plan and the quality of the final version of MEP;
- a Municipal Energy Plan is a document to be approved by a local city council;
- a short MEP is a document which consists of all key items of the main MEP and shall be distributed among deputies of a local city council;
- six annexes which are compliant with sections of the MEP and consist of all justifications, calculations, results of analysis used as a basis for key items and procedures and which are part of the MEP. The annexes will be used by specialists of the local city council and other stakeholders in course of MEP implementation and preparation of a new MEP for the medium-term perspective.

**Motivation Letter**

**Concept of MEP**

**Explanation Letter to MEP**

**Annex 1. Description of the Base Line Scenario**

**Annex 2. Limitations as regards implementation of MEP**

**Annex 3. Catalogue of Energy Efficiency Investment Projects**

**Annex 4. Program for encouragement of energy efficiency (“soft” measures)**

**Annex 5. Investment Program of MEP**



**Municipal Energy Plan**



**A short version of MEP**



**Annex 6. Program of implementation and monitoring of MEP**

## **Contents of the Municipal Energy Plan**

A Municipal Energy Plan is fully compliant with the EU requirements to such documents:

*List of abbreviations*

*Document profile*

*Introduction*

*How MEP is related to other documents of the Municipality*

*Section 1. Strategic priorities of energy efficient municipal development*

*Section 2. Description of a Base Line Scenario*

*Section 3. Limitations as regards implementation of MEP*

*Section 4. Strategic goal, tasks, coverage and stakeholders of MEP*

*Section 5. Catalogue of Energy Efficient Investment Projects under MEP*

*Section 6. Program for encouragement of energy efficiency (“soft” measures)*

*Section 7. Investment Program of MEP*

*Section 8. Expected results of implementation of MEP*

*Section 9. Organization of implementation of MEP*

*Section 10. Monitoring of implementation of MEP*

*Annexes*

## **Results of analysis of barriers to and restrictions as regards increasing energy efficiency**

In course of development of MEPs, identified were main problems and barriers to increasing energy efficiency for the cities in whole, and for key stakeholders.

In particular, as regards local authorities, a significant problem is a regular increase in costs of energy resources. As consumption and costs of energy resources increase, their share in the budget items of expense is going up, that results in decreased financing of capital expenses. For instance, in a local budget of Vinnytsia, the share of costs for energy carriers increased from 7,1% in 2007 to 10,8% in 2010.

Public buildings consume much energy. The analysis of efficiency of consumption in public buildings in Khmelnytsky revealed that only 19 out of 136 public buildings in the city consume energy (kilowatt-hour/m<sup>2</sup> a year) according to State Building Norms DBN B.2.6-31: 2006 “Design of buildings and facilities. Heat insulation of buildings”. Net energy consumption in 37 public buildings is twice as higher as

the standard consumption, 28 public buildings – three times, and 52 buildings – four times and more. This is the case in other cities.

City executive authorities and deputies of local city councils often have erroneous understanding about efficiency of energy efficiency measures and projects, expediency of replacement of natural gas with alternative fuels, prioritization of projects, etc.

Inconsistency of energy policy, absent or existing on paper system of energy management result in a situation when money allocated for energy efficiency are spent wastefully and makes it impossible to use the available investment potential of municipalities for implementation of energy efficient projects. This slows energy efficient development of municipalities down.

Heating utilities and consumers of heating services also are important players in the market of energy efficiency.

As regards heating utilities in focus, it is worth mentioning that they go beyond the fixed heat output against the connected heat load (it is from 50% for Rivne up to almost 250% for Vinnytsia); the operation life of boiler equipment at many boiler houses is considerably long; many boilers have diffusive inefficient burners; it is impossible to establish metered components of heat balance and heat energy losses resulting from the lack of heat meters; the system of energy management is weak.

Considering the existing conditions, the specialists of RTC MDI determined the energy efficiency potential for heating utilities that is 4...5% for heat energy production and 5..10% for heat energy transportation.

Analysis of heat energy consumption in the residential sector of the cities in focus showed that it is from 190 kilowatt-hour/m<sup>2</sup> a year in Khmelnytsky to 260 kilowatt-hour/m<sup>2</sup> a year in Chernigiv. Heat losses in residential buildings make up to 50...70% of available heat energy consumption.

Unfortunately, most of residents do not understand their role in the energy conservation effort and do not know much about energy efficiency. Associations of homeowners are more interested in increasing energy efficiency of residential buildings but presently the progress as regards establishment of condominiums is not good enough.

Limited financial resources of residents is one of the barriers on the way to increasing demand side energy efficiency. At the same time, public opinion survey results show that many consumers are ready to pay for the improved heat comfort and living conditions in their apartments. Nevertheless, in the cities in focus, so far not a single energy efficiency project was implemented with co-financing from a local self-government or private investors.

In MEPs which were prepared for pilot cities, proposed were solutions for overcoming these and other barriers and limitations.

## **Role of municipal energy planning in energy efficient local development (based on results of analysis of the process of municipal energy planning in six cities in Ukraine)**

### **Current status**

In course of development of Municipal Energy Plans, problems, threats and limitations to increasing energy efficiency in cities in general and specifically for some stakeholders, were scrutinized.

Briefly the results are presented below.

### **Local authorities**

Regular increases in prices for energy resources entail raising costs for energy resources and raising share of energy resources costs in budgetary expenditures of the city and reducing capital costs. For pilot cities, the share of energy resources costs in a local budget in recent years went up from 3,8%...7,1% (Rivne and Vinnytsia accordingly in 2007) to 6,7%...10,8% (Khmelnysky and Vinnytsia accordingly in 2010). Thus, high energy consumption under raising costs for energy resources jeopardizes sustainable local development and national development in whole.

No systematic energy efficiency policy results in the situation when money allocated for energy efficiency are used ineffectively and the investment potential of cities is not used at all.

Energy consumption in public buildings is very high. The analysis of efficiency of energy consumption in public buildings in Khmelnytsky showed that net energy consumption (kilowatt-hour/m<sup>2</sup> a year) in only 19 out of 136 public buildings is more or less compliant with requirements of State Building Norms DBN B.2.6-31: 2006 "Design of buildings and facilities. Heat insulation of buildings". Net energy consumption in 37 public buildings is twice as higher as the standard energy consumption, 28 buildings – three times as higher, 52 buildings – four times as higher and more. The situation is same or even worse in other cities.

The system of energy management, which is either not in place or existing only "on paper", does not allow for efficient use of energy resources and for identification of the most attractive priority projects. This situation also results in excessive heat energy consumption.

Limited resources of local budgets allow municipalities to finance only demonstration and pilot energy efficiency projects. So, attraction of loans, private capital under PPPs, grants and other kinds of international technical assistance is a priority. This shall be a regular effort of local city councils but their structure does not provide for corresponding divisions which could be in charge of this activity.

Local executive authorities and deputies of local city councils often do not have clear understanding about energy efficiency measures and projects, expediency of replacement of natural gas with alternative fuels, prioritization of projects, impact of "soft" measures on energy efficiency, etc. Thus, energy efficient municipal development does not take place or the speed of positive changes is very low.

### **Heating utilities**

As regards heating utilities of pilot cities, it is worth mentioning that they go beyond the fixed heat output against the connected heat load. It is from 50% (Rivne) up to almost 250% (Vinnytsia). The dynamics of sales of heat energy to residential and public buildings during 2008...2010 shows that costs of fuel for heat production were permanently increasing. The main reason for such the increase is raising prices for natural gas that is a main source of heat energy for heating utilities in Ukraine. In Korosten, in the structure of cost price natural gas costs make up to 90%.

Analysis of performance of heating utilities revealed that:

- the operation life of boiler equipment at many boiler houses is considerably long;
- most of boilers are used for heating water;
- many boilers have diffusive inefficient burners;

- the number of heat meters is not enough for establishment of metered components of heat balance, heat energy losses and effective energy management at municipal heating utilities;
- regulation of heat supply is imperfect (excessive heat supply to buildings in summer and spring; heat regulation by consumers who have heat meters installed; a need to review the concept of heat supply at boiler houses and central heating points);
- there exists a considerable potential for energy efficiency of heat energy transportation in the heating systems of pilot cities. The main reason for heat losses is extensive depreciation of heating networks.

The analysis showed that energy efficiency potential is 4...5% for heat energy production and 5...10% for heat energy transportation (depending on a city).

One more barrier to reducing natural gas costs (which are regularly increasing) is absence of a necessary potential of renewable sources of energy. This is the lack of necessary resources of biomass, low wind speed, no way to use heat energy as a commodity during a long time. The possible consequences of the above could be inefficient use of renewable sources of energy or low economic efficiency of heat energy regeneration. Analysis of the potential and accessibility of alternative and renewable sources of energy disclosed that so far short- and medium-term energy efficiency projects are not implemented at the stage of heat energy production, transportation and consumption, and the projects which provide for substitution of natural gas are not economically feasible. In addition, transition to solid fuels and renewable sources of energy (pellets, straw, peat, timber), as a rule, causes the growing concentration of polluting toxic substances which are the result of burning fuel and which go to atmosphere.

Excessive heat energy losses is a consequence of the absence of the developed modern system of energy management at heating utilities. It does not allow for determining baseline current heat energy consumption and making an estimation of the economic effect of implementation of energy efficiency measures.

Most of heating utilities in pilot cities which were surveyed by specialists of RTC MDI are at a loss.

## **Public**

The assessment of effectiveness of energy consumption in residential buildings of pilot cities proved too high net energy consumption – from 190 (Khmelnysky) to 260 (Chernigiv) kilowatt-hour/m<sup>2</sup> a year. Excessive energy losses in residential buildings make up to 50...70% of current energy consumption.

Most of residents do not understand their role in the energy conservation effort and do not know much about energy efficiency. It somehow becomes even more complicated because of property rights in a multi-apartment residential building when privatized apartments are owned by residents and the building is on the balance sheet of a ZHEK. In such circumstances the residents do not see the building as their property and do not take care about it. The state of affairs somehow changed when condominiums started to appear but the number of condominiums is not more than 10% of the housing stock.

In pilot cities there are not enough institutions which would support a condominium as a single owner of a residential building and would create incentives for implementation of energy efficiency improvements. Besides, there are practically no organizations which would protect the rights of condominiums and building residents. Thus, condominiums and residents feel unprotected that slows down the pace of development of condominiums.

The limited financial resources of building residents is the main barrier to demand side energy efficiency. However, the survey shows that in many Ukrainian cities residents are ready to spend some money for improving their living conditions. Nevertheless, not in a single pilot city energy efficiency projects were implemented with co-financing from city authorities or private investors. Also there are no ESCOs which could help residents attract financing for thermal modernization of buildings.

## **Expectations from implementation of Municipal Energy Plans developed by RTC MDI**

### **City authorities, public buildings**

The Municipal Energy Plans, which were developed by RTC MDI, provide for implementation of the effective system of energy management “city – heating utilities – public institutions – consumers”. This will help achieve annual heat energy savings in public buildings of 1,1 thousand Gcal a year (for Korosten) to 6,7 thousand Gcal a year (for Chernigiv). At the same, time it is expected that the efficiency of heat energy production at heating utilities will increase and heat energy losses in heating networks will reduce.

Every pilot city implements projects which provide for thermal modernization of public buildings (from five in Korosten to 38 in Vinnytsia) and for low cost energy efficiency measures in other public buildings. The expected total reduction of energy consumption in public buildings against the baseline year is 12,5% (for Rivne) to 26% (for Vinnytsia), while money savings will make dozens of millions of UAH.

It is expected that, first of all, the share of costs of energy resources in municipal budgets will reduce, and in the future it will become stable (reduce).

Electric energy savings will be large.

### **Heating utilities**

Owing to improved energy management, more efficient energy consumption, and implementation of energy efficient projects, expected is annual natural gas savings against the baseline year from 11% (for Vinnytsia) to 20% (for Khmelnytsky), and money savings of dozens millions of UAH. Electric energy savings will be large.

Envisaged is implementation of demonstration projects and pilot projects which provide to substitution of natural gas with alternative and renewable sources of energy.

It is anticipated that attraction of private capital and money of residents will be the consequence of implementation of complex projects.

### **Public**

The implementation of the Program for promotion of energy efficiency will help:

- increase the number of effective homeowners (condominiums) in 5 times;
- establish effective housing management organizations (housing management companies);
- develop conscious and energy efficient residents as a main consumer of energy resources owing to implementation of education and outreach programs at schools, higher educational establishments, and implementation of information campaigns.

It is expected that demonstration projects which provide for thermal modernization of residential buildings will be implemented with co-financing from residents.

It is expected that the quality of heat supply and hot (tap) water supply will become better in general (due to the effective energy management system) and for particular objects (due to implementation of energy efficient measures and projects).

Reduced consumption of primary fuel will result in corresponding reduction of harmful emissions and greenhouse gases from heat energy production in the district heating system.

## **Conclusions**

Municipal energy planning helps achieve significant economic, social and environmental effect for a quite short period of time (3...5 years). The government shall create legislative grounds for dissemination of best practices of the cities where Municipal Energy Plans were developed and are implemented. Other Ukrainian cities shall adopt these best practices of MEP development and implementation. Dissemination of best practices of municipal energy planning will bring good results for Ukraine in general and will support the growth of its energy efficiency.

The development of Municipal Energy Plans may become an efficient mechanism of overcoming present day energy and environmental challenges through intensive energy efficient development of Ukraine's cities.