LOCAL ENERGY ACTION PLAN OF MUNICIPALITY OF MISKOLC

ENGLISH SUMMARY

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1 SUMMARY

1.1 A brief summary of the content of the study

- A short introduction is included in the introductory section, along with data on the population and management (including those related to energy consumption) of Miskolc Town and Borsod-Abaúj-Zemplén County. The study discusses expected development of the town, along with relevant energy issues and the role of the municipality in energy management.
- following this, the study appraises the status of energy (electric power, natural gas, district heating, other fuels and renewable energy sources) and water supplies including supply sources, capacity requirements, consumption data, supply reliability issues and supply providers' vision of the future,
- in what follows the study deals in detail with energy management data of municipal institutions (sources, capacity requirements, consumptions and costs), and considers proposals for energy rationalization,
- in the final chapters the study describes changes in the regulatory environment, the reasonable technical and organizational development directions, environmental impacts and outlines application opportunities.

1.2 Findings of the study

- The electric power requirement of the town is basically composed of two parts (household and industrial consumers). In the past the operation of big industrial plants was decisive, but these industrial plants have been closed or are operated at restricted capacity and, as a result, the consumption dropped by 13% in comparison with the year 2003. The current peak demand is between 90 and 100 MW, and an additional 40 MW is required when DAM is being operated. The electric power grid provides reliable supply and, despite the existing power grid capacity that seems abundant now, ÉMÁSZ Hálózati Kft. performs continuous developments in its power supply system.
- The natural gas network within the town is owned by TIGÁZ-DSO Földgázelosztó Kft. The natural gas is fed into this network at two feeding points from the national gas pipeline system. After market liberalization the natural gas is supplied by gas traders. The natural gas is supplied to most of the consumers by TIGÁZ Zrt. as a trader. Natural gas

is supplied to more than 88% of the households, and this level is high, considering the national average level. Compared to 2003, natural gas consumption dropped by approx. 24%, while the number of customers has not changed considerably. The reduction ceased in the past 3 years and the consumption fluctuates around the level of 110 million Nm3. The level and reliability of supply can be regarded as appropriate. TIGÁZ-DSO Földgázelosztó Kft examines the feasibility of starting installation of the natural gas distribution network in Ómassa town section that is unprovided yet, and of laying gas distribution pipes in the streets where these are not available yet.

- MIHŐ Miskolci Hőszolgáltató Kft., which operates the second largest district heating system of the country, provides district heating in the town. District heating is supplied to more than 32,000 flats (42% of all flats) and to 1,000 corporate customers. 11 thermal power plants provides district heating to Miskolc Town through 12 district heating systems. The total installed capacity is 429.752 MW_{th} and the peak demand is equal to 205.8 MW. In the past three years the total heat quantity supplied was roughly 1340 TJ/year, of which the share of the households is 80%. Thanks to the energy source modernizations conducted over the past decade, most (70%) of the supplied heat is produced by cogeneration (thermal energy + electricity). The thermal power plants are operational, and can reliably satisfy capacity demands. Over the recent years MIHŐ Kft. took a number of measures (installation of gas engines and combined cycle thermal power stations) to improve cost-effectiveness of production, and by applying techniques to improve quality, they succeeded in retaining district heating customers. Now the customers recognize that district heating is a highly convenient, cost-effective, reliable and eco-friendly heating method.

- The use of renewable energy sources as an alternative solution is very important, because the town has already made use of the technical opportunities to reduce the costs of natural gas-based energy generation. To use a considerable amount of renewable energy, the fastest, most environmentally friendly and effective way that requires the lowest level of infrastructure reconstruction is involving the district heating network of the town in heat generation. This method should be preferred in the zones to which district heating is supplied, and individual solutions may only be preferred outside these zones. The use of renewable energy sources may only result in cost reductions in both district heating and individual heat generation systems. Of the energy sources for district heating, the installation of wood chip fired boilers should be taken into consideration and the

utilization of geothermal energy should be increased, and individual energy consumers should be motivated to use these energies as well as solar energy and heat pumps for energy generation. Favourable central application opportunities are available for the utilization of renewable energies. The town should facilitate the utilization of these energy sources, to mitigate environmental burdens in the town as well.

- MIVÍZ Miskolc Waterworks Limited Liability Company (MIVÍZ Kft) provides water supply, wastewater drainage and treatment services on the territory of Miskolc Town and Felsőzsolca. The reliable water supply, the professional operation of waterworks and maintaining financial and economic stability of the water company are of paramount importance. For the time being, 8 production facilities belong to carstic water sources of Miskolc Town. The most important of these facilities is Waterworks in Miskolctapolca, whose capacity exceeds 50% of the water volume to be supplied to the town. The number of inhabitants supplied from the from the water sources is approx. 178 000. The facilities of waterworks are generally in a good state of repair, but various maintenance works should be conducted for reliable operation. It is a problem that the water can get contaminated in the catchment area, i.e. a bacterial contamination may be caused by infiltrated contaminants. The fact that settlements in the area have no completely closed sewer networks contributes to the problem. MIVÍZ Kft. monitors contamination sources on a regular basis. In the past three years the annual drinking water consumption decreased from 10.125 million m^3 to 8.704 million m^3. The burden on the sewer systems has also decreased from 9.354 m^3 to 8.147 million m^3 in the past three years. The wastewater treatment plant in Miskolc clarifies wastewaters generated in Miskolc Town and its outskirts and treats the wastewater sludge obtained. Wastewaters are clarified in two steps in the plant with a theoretical capacity of 70,000 m3/day. After mechanical pre-clarification, organic matters in the wastewater are decomposed in the second stage. For lack of Treatment Stage III, the nutrients (N, P) are not removed from the water and are discharged into the receiving Sajó River.

- According to data collected in 2008, the municipal institutions consumed a total amount of natural gas of 5.54 million m^3 and of electricity of 7.68 million kWh, while the institutions connected to the district heating system consumed a total amount of thermal energy of 108,282 GJ. The annual cost of the natural gas consumption was almost HUF 560 million, while the annual cost of electricity consumption in round figures was HUF 310 million, and the cost of the thermal energy was HUF 324 million. The cost of all

energy types reached HUF 1,194 million. The study examines energy consumption (electricity, natural gas and district heating) in each institution separately, and based on this examination 13 institutions can be selected where the heat consumption considerably exceeds the average level and where the heat consumption can be reduced by replacing windows and with subsequent wall insulation; applications have been submitted for 3 institutions concerned. Considering preliminary figures, the total investment cost amounting to HUF 248.5 million results in an annual cost saving of HUF 45.2 million. Another rationalization opportunity is to connect the institutions to the district heating system. In some part of the institutions (40 institutions) heat energy is generated by their own boiler houses, and 20 boiler house can be reasonably abandoned if the heat was provided by district heating. The investment requirement is approx. HUF 500 million that would result in an annual saving of almost HUF 46 million. An important consideration is that the Municipality can count on 50% non-refundable subsidy related to the investment cost, which improves the rate on return considerably, provided that appropriate applications are submitted to the National Development Agency (NDA).

- Based on the air pollution data measured in Miskolc, it can be ascertained that the levels measured in the half-year heating season are higher than those measured outside the heating season. A significant part of limit transgressions occurs during the heating season. In the future the environmental burdens can be mitigated in the field of energy management by taking the following measures.
    - Connections to the district heating system should be motivated instead of individual heating systems.
    - Another solution is the conversion to firing with natural gas where solid fuels are used now. (It should be noted that this solution is advantageous only with a view to environmental protection, but it obviously imposes additional costs on the users.)
    - The greatest effect would be achieved by switching over to renewable energies (biomass, heat pumps and solar energy) on a large scale. Advantageous application opportunities are available to use renewable energies, by reducing investment costs needed for switchover. After switchover, the energy costs are considerably lower compared to natural gas firing.
- The issues regarding sale of co-generated thermal energy and electricity are important in the energy management of the town. At the moment the sale of the electricity generated

by gas engines and combined cycle thermal power plants is supported and is subject to mandatory purchase. The supported price and the mandatory power purchase will remain valid until 31 December 2010 in the gas engine power plant in Tatár Street, until 30 November 2012 in the gas engine power plant in Diósgyőr , until 31 August 2015 in the gas engine power plant at Bulgárföld and until 31 December 2015 in the Combined Cycle Power Plant with a Turbine for Heating in Hold Street. This change in regulatory environment will exert a disadvantageous effect on the price of thermal energy as well.

- The fundamental objective of the institutional energy management is to provide reliable energy supply to the institutions at the lowest possible cost. The point of the management is to determine whether a given consumption is justified during energy utilization, and in case of excessive consumption an intervention should be done. This objective can only be achieved if sufficient information is available, and information will be provided to everyone concerned, while the intervention is institutionalized, i.e. the central energy management system is functioning.

- Concerning energy investments, MIHŐ Kft and the Local Government of Miskolc Town with County Rights can submit an application within the framework of the application schemes titled “Building Energy Developments and Modernization of Public Lighting” and “Power Engineering Developments in the District Heating Sector” included in “Efficient Energy Consumption” which has been issued by the National Development Agency and classified as Priority Five in the “Environment and Energy Operative Program” (its Hungarian abbreviation is KEOP).

1.3 Proposals

- The energy management system of the institutions of the Municipality should be strengthened and centrally directed by MIHŐ Kft.
- Any data regarding the institutions should be updated and refined regularly and, based on available consumption data, current consumption data should be evaluated by comparing them to the specific consumption data defined in the study.
- The institutional buildings that will remain in the possession of the Municipality in the short, medium and long run should be determined, based on which the renewals should be scheduled.
- Measures should be taken (conducting a feasibility study and compiling application material) to compile applications to acquire sources required for investments including

replacement of windows and doors and application of subsequent wall insulations, in order to reduce heat consumption in the institutions specified in the study. The funds needed to compile the application material should be ensured.

- Measures should be taken as described in the previous paragraph to compile application material so that district heating services can be provided to the institutions specified in the study.
- In MIHŐ Kft's area of supply, the measures taken to use geothermal energy should be supported.
- The feasibility of installing one or more biomass (wood chip) fired boilers and its impact on the heat price should be examined. In case of a positive result a decision should be made on starting project preparation activities.
- It is reasonable to entrust MIHŐ Kft. with the operation of all boiler houses, considering in-kind contribution to classify thermal energy-related costs into the 5 percent VAT rate category.
- The energy audits of the Municipal Institutions should be conducted in 2 steps: in the first stage for the institutions whose ground floor exceeds 1000 m2, and for all the remaining institutions in the second stage; following this, additional energy tasks can be defined.

2 INTRODUCTION

2.1 Borsod-Abaúj-Zemplén County

Borsod-Abaúj-Zemplén County has the second largest territory in the country and is a part of the North Hungary Region. It territory is equal to 7,250 km^2; on 1 January 2009 the number of its inhabitants is 701,160 and the population density is 96.7 persons/km^2.

2.2 Miskolc Town with County Rights

Miskolc is the seat of Borsod-Abaúj-Zemplén County and is the third most populous town in the country, after Budapest and Debrecen; on 1 January 2009 its resident population was equal to 170,234 persons. The town was built on the eastern side of the Bükk Mountain, in the valley of Szinva, Hejő and Sajó Rivers, at the meeting point of different natural and economic regions. The area of Miskolc is 236.68 km^2, of which 58.02 km^2 is inner area. The width of the inner area in east-west direction is 19 km, and 10 km in north-south direction. Despite decreasing number of inhabitants, the town belongs to the densely populated county towns. In 2008, an average of 720 people lived in 1 km^2. Both a natural decrease of population and losses from migration have an impact on the number of inhabitants. As a result, the number of inhabitants of the town decreased by more than 17,000 people in the past decade.

The following pieces of information are official data issued by the National Statistical Office for 2008.

Data regarding **resident population**: compared to 2001, the number of inhabitants of the town decreased by 6.7 %.

At the end of 2008, the **housing stock** of the town was composed of 75,747 flats. On average, 2.25 person lived in a flat and 335 new flats were built in 2008 with an average floorspace of 96 m^2.

In 2008 89%, 98% and almost 90% of the flats were connected to the **natural gas network, water network and sewer network,** respectively.

In Borsod-Abaúj-Zemplén County almost one third of the **registered enterprises** and 47% of the associated enterprises are concentrated in Miskolc.

Based on data collected at the end of 2008, MVK Zrt. provided **public transportation** in Miskolc by means of 190 buses and 42 trams. The number of **passenger cars** registered in the town at the end of 2008 approached 46,000. The number of cars per 1000 inhabitants is higher in every county town (including the capital) than in Miskolc. The proportion of households **connected to the cable television network** is 73.4 %.

2.3 Energy figures in the town, energy balance

On the basis of data supplied by service providers' and of statistical data processing detailed in later chapters, the current power, natural gas and district heat consumptions of the town will be presented later, divided into household and non-household (industrial, communal, etc.) sectors.

Based on statistical data, the energy consumption in Miskolc Town with County Rights has changed as follows:

Amounts of electricity, natural gas and district heating supplied in the years between 1995 and 2009							
Year		1995	2000	2004	2005	2008	2009
Total electricity	MWh	789 660	737 763	835 912	731 131	891 744	785 134
Electricity to households	MWh	119 642	124 350	147 359	153 046	153 035	134 739
Total natural gas	th m^3	136 884	134 777	135 129	157 732	115 382	108 240
Natural gas to households	th m^3	58 359	58 623	66 176	70 395	57 823	53 794
Total amount of district heating sold	GJ	1 941 566	1 683 591	1 691 910	1 641 878	1 339 032	1 262 696
Amount of district heating sold to households	GJ	1 598 956	1 339 102	1 387 259	1 336 472	1 098 342	1 026 704

Energy consumption

The table shows the following trends:

- The electric power consumption of the households has increased considerably.
- The natural gas consumption stagnated in the town until 2004 and reached its peak level in that year, and a decline can be observed since then.
- District heating sales have also declined. The amount of heat sold in 2000 dropped from 1,684 thousand GJ to 1.339 thousand GJ in 2008 and in 2009 an additional 6% decline occurred, but this decline can be attributed to weather conditions first of all.

2.4 Expected development of the town and energy consequences thereof

The medium-term objectives regarding energy and environmental protection are as follows:

- Protection of environmental status and rehabilitation of green areas, improving public hygiene considerably, especially in the vicinity of residential areas and waste storage facilities.
- Reduction in energy consumption; to that end, large scale prefabricated concrete block reconstruction programs are implemented, and the district heating system in Miskolc should be rationalized, including installation of boiler house and gas engines units to make use of the landfill gas produced at the one-time refuse site at Nádasrét.
- Rehabilitation of neglected inconvenient residential areas or demolition thereof in a few cases.
- Starting rehabilitation of brown-field lands or buildings in unutilized built-up areas, resulting in new communal or commercial functions, and, after their renewal, some part of these areas can provide land for modern small-scale industrial enterprises.
- Motivating economic and service delivery activities which contribute to energy savings and environmental awareness and protection.
- Utilization of renewable energy sources for energy purposes, renewal of neglected areas and buildings and pollutant emission reductions at the companies should be motivated by municipal regulations, for example with tax allowances (building tax or local business tax).

The property developments in the garden suburbs which have the greatest impact on the increase in household energy demand are either partially implemented in current agricultural areas or in small garden areas, or garden suburb type areas are further developed. The most part of this type of developments is expected primarily in the northern hilly part of the town, especially in Őzugró-Bodóoldal and Bodótető areas. Calculating with average energy demands in the flats and considering that these flats will have higher comfort level, an additional approx. 8.7 MW of power will be required, provided that all such developments have been implemented.

The settlement structure plan is not less ambitious about the areas designated for commercial and economic activities. An opportunity to conduct such activities will be provided in a total area of approx. 400 hectares. The most part of these areas provides opportunity to implement so called greenfield projects, but these areas include also restored lands which had been used for industrial activities earlier or are industrial type now, but a commercial activity is prognosticated instead

them after the reconstruction (e.g. eastern and western area of DIGÉP). Based on the experience gained from similar industrial parks and data of functioning industrial sites, the planned developments imply an additional electricity demand of approx. 40 MW. The energy requirements of the commercial activity can be estimated with similar uncertainty, because these values can differ considerably according to activity types. Calculating with average energy requirements of warehouse buildings and shopping centres, this type of activities would require an additional approx. 22 MW. Accordingly, the total energy requirement of the business activities is equal to approx. 62 MW.

Concerning natural gas demands, the constructions in the garden suburb require a gas capacity of approx. 6000 m3/h, while the new business zones will require an additional gas capacity of approx. 10.000 m3/h in round figures. Considering gas and electricity requirements, it can be seen that establishment of less energy intensive industries and business activities are expected according to the plans.

Naturally, the aforementioned energy demands do not induce absolute additional requirement, because demands will probably decrease in other parts of the town, simultaneously with the developments (the number of inhabitants will decrease according to the forecasts). At the same time, it should be established that the lines of the existing energy supply network are unable to meet the requirements of these developments. In several areas designated for development of family house zones public utility services should be established at several places and, what is more important, a new electric substation should be installed somewhere in the northern hilly area, probably at Bodótető. The energy supply to new industrial zones also requires developments. A new substation should probably be installed from the 120 kV transmission line to supply power to the biggest industrial area (industrial parks at Szima and in Martintelep), in the vicinity thereof. The eastern substation of ÉMÁSZ should also be extended.

Ensuring adequate natural gas supply will probably necessitate a major investment, since the existing medium pressure network should be reconstructed and extended (mostly in industrial areas) to satisfy new demands.

2.5 Power engineering tasks falling within the competence of the municipality

In the administrative system established in Hungary, the municipalities of the settlements have both mandatory and voluntary tasks.

The “mandatory” energy tasks in Miskolc include the following (the order of the tasks does not set priority!):

- operation and development of public lighting;
- district heating supervision, exercise of owner’s rights and protecting consumers’ interests;
- financing energy supply to municipal institutions and supervision of institutional energy management;
- maintenance and modernization of the energy facilities of the institutions;
- supervision of water supply and wastewater treatment, exercise of owner’s rights and protecting consumers’ interests;
- participation in drawing up energy system development plans, in respect of drawing up arrangement plans and of development permits;
- managing energy elements of building licensing procedures.

On the other hand, a well-functioning municipality should take responsibility also for the entire town, the citizens and non-municipal institutions and companies functioning in the town, i.e. it should accomplish the following tasks, too:

- drawing up and implementing the energy policy of the town,
- maintaining contact with energy service providers in respect of town affairs,
- facilitating utilization of available local energy types,
- supporting household and institutional energy savings,
- organizational tasks related to taking advantage of national energy initiatives (e.g. support programs) in the town,
- monitoring local environmental impacts of energy consumption.

In what follows a summary is provided on the accomplishment of the aforementioned tasks in Miskolc.

The following statements can be made on public lighting. Public lighting plays a very important role in the direct energy costs of the Municipality of Miskolc

The operation of 21,500 light sources is an essential task, its net annual cost amounts up to HUF 370 million. The total installed capacity of the light sources decreased from 3 MW to 2.3 MW after the modernization conducted in 2003. The annual power consumption of the lighting system reaches 9.2 million kWh.

The tasks related to public lighting fall within the competence of the Building, Environmental Protection and Town Operating Department. The capacities required for this task and adequate professional skills are available here, resulting in the professional operation of the public lighting system in Miskolc. The modernization of the lighting system will be continued in 2010, too. The luminaires (4,518 pcs) which have a low power consumption but are obsolete and less reliable and go wrong frequently will be replaced. The primary objective is to improve reliability and people's sense of security. The modernisation will lessen the installed capacity to a small extent (50kW) compared to that achieved six years ago, resulting in a cost saving amounting to HUF 7 million per year.

The municipality does not exercise daily operational supervision over the district heating company, but Miskolc Holding Zrt. keeps the company under continuous financial control. Customer complaints are managed by the district heating company. At the same time, the Municipality responds to any major change occurring in the environment of the district heating system: Miskolc Holding Zrt. and the Town Council discuss the proposals submitted by MIHŐ Kft., and Miskolc Holding Zrt. will make all important decisions on essential strategic issues and major projects, while the Town Council decides on pricing and district heating regulations. The study deals with district heating separately as an important field of the energy strategy of the town.

The municipality has no direct influence on the energy management and operation of the energy equipment of the institutions. The institutions accomplish maintenance and operation tasks alone, either with their own employees or by involving external specialised companies. At the same time, the municipality ensures annual budgets including energy costs to the institutions. This process, however, is not supported by an effective energy management system, as described in detail in the chapter dealing with institutional energy management.

Some initiatives have been taken to review institutional energy management, but some comprehensive loss investigation covering all institutions has not been conducted.

Miskolci Beruházó és Szolgáltató Kft. (MIBERSZOLG Kft.) provides professional background for the modernization of the power engineering equipment of the institutions.

The energy costs of the institutions are financed from the budget. The institutions themselves plan annual costs, and these plans are approved by the Financial Department of the Mayor's Office.

Energy consumption data are used only for budget planning. These data are not used for energy management purposes (statistics, calculation of specific values, measuring energy efficiency of the institutions, etc.).

Similarly to district heating, the municipality does not exercise daily operational supervision over water supply and wastewater treatment, but as the owner of MIVÍZ Miskolci Vízmű Kft. and a local authority takes part, in a decisive manner, in making every important strategic decision and in creating a regulatory environment for water supply.

Concerning elaboration and implementation of an energy policy for the town, Miskolc Town has made the following achievements:

- The Settlement Structure Plan has been approved and has undergone a continuous improvement, and this plan deals in detail with the energy supply to the Town, with a view to meeting additional demands induced by the development of the Town first of all, but some general energy strategy theses have been drawn up, too.
- Elaboration of the material titled “Development Program for Miskolc Town with County Rights for 2001 to 2003”, and this program also deals with energy issues in connection with development.
- The Environmental Status Report of the Town has been prepared, which also includes a brief energy management chapter, and the impacts on the environment exerted by energy management are also mentioned when examining the environmental status.
- As early as in 1999, the concept plan titled “Energy Strategy of Miskolc Town” was drawn up.
- As a continuation and update to the aforementioned material, the study titled “Energy Concept of Miskolc Town with County Rights” was prepared in 2002.
- In 2009 MIHŐ Kft. started to conduct energy supervisions in the institutions, and an energy action plan was drawn up for the years 2010 and 2011.

An organized process has been started, whose steps with deadlines will realize cost reduction in the future.

The contact maintained with the energy service providers becomes intensive when the public utility systems are being developed, but it can be said that even daily contact is maintained with both electricity and gas suppliers, if required.

The Town successfully took advantage of the national energy efficiency programs as far as possible: for the modernization of both the public lighting system and the district heating system

(switchover to measurement-based settlements, variable mass flow control, modernization of the thermal power plant in Tatár Street – installation of a heat exchanger, etc.), and applications have been submitted for various advantageous funds.

The environmental status report referred to above examines the impacts exerted by the energy consumption on local environment.

2.6 The role of the municipality in improving energy efficiency

The local advantageous effects of energy efficiency and energy saving are:

- In the future the energy bills of the municipality will increase faster than other costs, partly because of further price hikes, but also partly because the consumption will grow slowly but continuously. Accordingly, relatively modest savings in the amount of energy consumed may lead to considerable total cost savings.
- Saving energy, which is a significant total cost component, may increase development funds that can be spent without restrictions, i.e. the municipalities' freedom of choice is increased.
- The implementation of projects related to energy efficiency and energy savings creates new job opportunities, though the automation resulted from modernization may make some employees redundant. The improvement achieved in local employment increases the income of the municipalities and, at the same time, lessens the unemployment-based burdens of the municipality.
- The large scale energy rationalization programs may go beyond the area of the municipality and require collaboration and cooperation between several municipalities or regions. The regional approach and the experience gained from cooperation will be key factors in the acquisition of European funds in the future.
- The more efficient energy consumption mitigates relevant local environmental harms and improves the chance of protecting local natural environment. On the other hand, generation of alternative energies results in reduction of the amount of polluting wastes, helping to create a cleaner and healthier environment.
- The funds obtained from energy savings can be used, for example, to stimulate the activities of local enterprises, in addition to the savings that can be achieved by the enterprises and the households as a result of the energy saving programs directed by the municipalities.

- The rationalization programs implemented in the field of energy management can serve as an example for other fields too, i.e. the reasonable and more effective way of looking at things may spread to the entire management of the municipality.

2.7 The municipality as an energy consumer

The municipality has and operates institutions and provides services to the community. It follows from this that the municipality should bear all relevant costs including energy costs. Accordingly, the municipality is directly interested financially in energy savings.

The energy consumption of the municipality can basically be divided into three groups:

Group 1: institutions that belong to the municipality (administrative offices, schools, cultural institutions, sport, health and social facilities and residential buildings, municipal tenements)

Group 2: vehicles that belong to the municipality

Group 3: municipal service facilities (public lighting, water supply, canalization, wastewater treatment)

The following activities are to be accomplished by the municipality as an energy consumer:

Concerning Group 1:

- operation of an appropriate energy management system
- conducting energy supervisions
- preparing feasibility studies for modernization proposals
- elaboration of an efficiency improvement program for several years (e.g. building shell insulation, modernization of the heating systems, regulations and monitoring systems)
- consumption measurements in every building or possibly by function (as a part of the energy management system)
- remote operation of the equipment (measurement, regulation, alarm)
- providing information regularly to those concerned, trainings for specialists

Concerning Group 2:

- regular supervision of the vehicle fleet
- consumption measurement and control for each vehicle
- drawing up preventive maintenance plans
- preparing a vehicle renewal program, and possibly
- route optimization

Concerning Group 3:

- drawing up a multi-year plan for the revisions of the institutions
- increasing the proportion of energy saving luminaires
- drawing up a preventive maintenance plan
- elaboration of measurement and consumption monitoring according to consumption points

The systematic accomplishment of these activities results in financial savings, reduction in energy consumption and, as a result, mitigation of environmental burdens. Another important achievement is that the attitude of the municipality may serve as a motivating example to the community and other energy consumers.

The aforementioned results, however, may only be achieved if adequate expertise is available and ready for collaboration, under continuous control and making modifications if required.

2.8 The municipality as an energy producer and energy distributor

The activity of the municipality covers the following areas:

- electric power generation, providing heating or cooling energy,
- optimal utilization of renewable energy sources,
- utilization of municipality wastes for energy purposes,
- district heat generation and distribution,
- influencing final energy consumption within the framework of demand side management (DSM).

To improve efficiency, in these areas the Municipality can do the following:

a) On the production side:

- conducting energy audits in the facilities
- preparing a feasibility study for modernization proposals
- improving the efficiency of the energy generation equipment and mitigating relevant environmental burdens
- taking financial, social and ecological considerations into account when selecting fuels
- motivating the use of renewable energy sources (biomass, solar energy, wind power, geothermal energy and hydraulic power)
- propagating cogeneration systems

- motivating some large-scale consumers to employ independent energy generation systems
- facilitating utilization of municipality wastes for energy purposes
- influencing energy demand on the final customer side, adapting production to demands

b.) At service/distribution level:

- conducting energy audits of the facilities
- improving the efficiency of the heat distribution network
- concluding distribution network operating agreements
- implementation of a measuring/invoicing system which motivates avoidance of overconsumption
- creating and updating an energy consumption database for the settlement
- integrated planning of energy networks
- system structure optimization to avoid unnecessary investments

c) On the energy consumption side

- searching for opportunities to reduce per capita energy consumption (without deterioration in quality), taking all necessary measures (e.g. DSM)
- adapting production and distribution to the final consumption side (planning according to the principle of least cost)

As a result of the activities mentioned above, the advantages listed in the introduction can be achieved: greater independence on the side of energy sources, saving fossil energies, local energy generation, increasing the proportion of renewable energy, mitigating environmental burdens and facilitating locale employment, etc.

2.9 Institutional background for energy management

MIHŐ Kft has prepared an energy saving regulation which provides comprehensive assistance for the institutions in their energy management efforts.

Based on this regulation, the institutions have established energy saving groups.

The energy consumption and energy management issues fall within the competence of the Building, Environmental Protection and Town Operating Department first of all, and MIHŐ Kft provides professional and organizational assistance in conducting this activity. MIBER Kft performs preparatory works for major energy projects.

Observing the activity of the Municipality, a continuous effort can be recognized to pay attention to this field. For example, in the past years a number of studies were conducted to clarify some energy issues or in connection with the general energy strategy. The settlement structure plan also goes into the details of energy supply, and the environmental status report of the Town and the Development Program also pay great attention to this topic.

The action plan and energy saving regulation drawn up by MIHŐ Kft. provides useful assistance to the municipality in its energy rationalization efforts.

3 THE ENERGY STATUS OF THE TOWN

Renewable energy sources

Hungary's international obligations and the characteristics of the energy consumption structure compel us to pay ever-increasing attention to renewable energy sources. In a general sense, the following materials are considered renewable energy sources:

- combustible agricultural wastes (straw, maize stalk, corn cob, grape shoot, fruit tree loppings, onion-skin, sunflower seed hull, etc.),
- combustible forestry wastes (branches, stumps, bark, wood chips for energy purposes),
- geothermal energy,
- solar energy,
- wind power,
- hydraulic power,
- communal wastes,
- wastewater sludge,
- waste heat of industrial plants (typically flue gas heat)
- industrial plants' organic wastes which are combustible and suitable for biogas production.

A common characteristic of the energy sources listed above is that their economical utilization is feasible only on the spot, because it is not reasonable to transport wastes with low energy potential (low temperature or yield) or waste energies over great distances.

The renewable or waste energies listed above are usually available free of charge or are much cheaper than conventional energy sources. At the same time, these energies can only be utilized by means of more expensive technological equipment.

Due to the local nature of the utilization, renewable energies may have special importance regarding municipal (or regional) energy management. To assess the opportunity in Miskolc, it is worth reviewing the most important relevant experiences gained in Hungary:

1. In addition to energy achievements in the narrow sense, utilization of renewable energies has advantageous effect on the environment and employment as well. Considering the greenhouse effect, renewable energies are neutral or have only a slight effect. Accordingly, renewable energy projects can count on environmental support schemes which are aimed at stimulating Hungary's activity against climatic change. On the other hand, utilization of renewable

energy sources (especially biomass) is a labour-demanding activity which creates local job opportunities.

2. It can be predicted that in the long run the price of renewable energies will go up slower than that of the natural gas.
3. Experience shows that in the current price system renewable energies are unambiguously competitive against the fuel oil and are mostly competitive against the liquefied gas. Renewable energies may be competitive against natural gas only if circumstances change considerably to the benefit of renewable energies (low or negative price of renewable energies, replacement of the development costs of the gas network, advantageous installation conditions, etc.).
4. Better economic indicators can usually be achieved, if the satisfaction of the heat demand of a given consumer is based ab ovo on renewable energy. The replacement of an existing gas firing equipment with an equipment fuelled by renewable energy sources can be advantageous only in a very few cases.
5. It is true for both renewable and waste energies that their profitability increases in line with the capacity of the unit, i.e. for the relevant projects utilization for district heating purposes or at least satisfaction of the demands of large-scale corporate or industrial consumers should be set as an aim, if it is possible.
6. In many cases the utilization of renewable and waste energies requires collaboration between multiple participants (e.g. agricultural plant or forestry, corporation or industrial company, district heating company, investor-contractor, financing provider, etc.). The municipalities can play an important role in supporting market processes and in establishing cooperation between the participants or in making the cooperation more effective.
7. The projects with high specific investment costs to utilize renewable energies may be profitable if their number of service hours is as high as possible. Accordingly, these technologies compete with each other and other energy supply methods (typically with cogeneration) for the consumers with steady energy demands.
8. Finally, it should be clearly stated that the technologies and engineering expertise required for the utilization of renewable and waste energies are available in the Hungarian market, and the owners of the projects may select among several contractors during the preparatory works and implementation alike.

For the time being, the energy generated from renewable sources covers 3.6% of the national energy consumption. According to the objectives of the national energy policy this proportion should be

increased to 7%. Concerning renewable energies, another national requirement is that the proportion of electricity generated from such sources compared to total power consumption should be increased from the current 0.5% to 3.6% until 2010 under the terms of Directive 2001/77/EC of the European Union. This latter objective requires an investment amounting to approx. HUF 80 to 100 billion at national economy level.

Considering that the proportion of renewable energies in Miskolc is not higher (in fact, lower) than the national figures mentioned above, it is obvious that renewable energies have no significant effect on strategic issues relating to energy supply in Miskolc. On the other hand, owing to the aforementioned advantages offered by renewable energy sources it is worth reviewing briefly the activities which can be accomplished by the Municipality to use renewable energies to a higher extent and the opportunities for their use.

Considering the relationship between the size and profitability of the equipment utilizing renewable energies, district heating provision seems to be an optimal use of renewable energies. An example already exists in Hungary, in Komló a 18 MW biomass fired hot water boiler has been installed to generate thermal energy cheaper than the natural gas-fired energy generation equipment. The utilization of geothermal energy also gains ground but only in the small heat supply system so far.

Another alternative is the utilization of the heat generated in incinerators. Such an urban or regional incinerator, however, would serve the purposes of environmental or waste management first of all, instead of energy strategy objectives. Some people consider the installation of regional incinerators, which generate electricity as well, one of the most promising opportunities to fulfil the obligations imposed by the EU Directive. On the other hand, these plans are not on the agenda yet and, what is more, the installation of an incinerator has not been taken into consideration in the regional complex waste treatment facility to be built in Hejőpapi region.

The energy supply to the municipal institutions is another field where the municipality can directly contribute to the utilization of renewable energies. In this field application of wood-burning boilers and utilization of solar energy or thermal energy or heat of groundwaters with heat pump are feasible. A general strategic proposal, however, cannot be made here, because each project is different and requires specific examination. In general it can be said that in the current regulatory and economic environment this type of investments are rarely, only under advantageous circumstances, competitive with conventional energy supply methods. Nevertheless, the Municipality can urge the implementation of such projects in the public institutions of the Town, considering the other advantages of renewable energies listed above.

A series of energy supervisions, whose necessity is mentioned in the chapter dealing with institutional energy management, conducted according to a program can be a proper tool to reveal opportunities for using renewable energies in the institution network of the Municipality of Miskolc.

The third alternative, which has significant potential at town level, is meeting some part of the household energy demands from renewable energy sources. The achievements of this solution can be characterized by the success of a previous central application for the same purpose, within the framework of this a number of household projects, including primarily equipment to produce hot water by utilizing solar energy, have been implemented. On the other hand, the Municipality has few opportunities for direct interventions in this field, unless it is able to provide funds to support such projects.

For the time being we think that such funds are not available, i.e. the Municipality can provide mainly professional assistance for the implementation of the projects where the community intends to use renewable energy. For example, the municipality can maintain a low-cost consulting office, where people can obtain reliable information on various technologies, suppliers, manufacturers, contractors with good references and on type solutions.

4 ENERGY MANAGEMENT OF MUNICIPALITY INSTITUTIONS

Based on 2008 data, institutions consumed an overall quantity of 3.56 million cubic metres of natural gas, 6.23 million kWh of electric energy, while institutions connected to the distant heating network consumed a total of 110 834 GJ of thermal energy. The cost of natural gas consumption was close to 360 million HUF, while the annual cost for electricity consumption was around 250 million HUF. Thermal energy cost 332 million HUF. Overall energy expenses were as high as 942 million HUF. This significant expense item justifies that an analysis is prepared with regard to the utilization of the different types of energy. In the course of the analysis different specific consumption data will be determined, in order to enable that consumption of the different institutions can be compared.

The institutions may be sorted into the following main categories:

- Nurseries
- Kindergartens
- Primary Schools
- Grammar Schools
- Student Homes
- Cultural Institutions
- Mayor’s Office
- Vocational Schools
- Vocational Secondary Schools
- Social Institutions

4.1 Supply sources

The types of energy used in the institutions:

- Natural gas
- Electricity
- Thermal energy

The natural gas, distant heating and electricity requirements of the institutions are ensured using the natural gas, distant heating and electricity networks available in the town of Miskolc. Regarding thermal energy, a high number of institutions are not connected to the distant heating network, but boiler plants have been set up in a total of 40 different locations for their thermal energy servicing.

The overall installed performance is as high as 18 MW.

The following observations may be made in relation to the boiler plants and the institutions they service.

- Half of the boilers are only used for heating purposes
- Heating is ensured using cast-metal or steel plate radiators
- The walls of buildings are predominantly made of brick
- 6 buildings are more than a hundred years old; only 4 have been constructed after 1980
- Only 16 buildings have been renovated since the beginning of the 1990s
- Many buildings are of a poor condition

A large part of these boilers are gas fuelled boilers of an output in excess of 100 kW. In respect of these, their energetics review is prescribed in the Government Decree No. 264/2008. (XI. 6.). According to Subsection b) of Section (1) of Article 4 of the Government Decree, gas fuelled heat producing apparatuses of an effective nominal output in excess of 100 kW have to be reviewed every four years, commencing from their commissioning.

During this review any potential gas leaks, the boiler insulation, any soot marks and the adequacy of control equipment and instruments have to be visually inspected. The output of the boiler also has to be determined (fuel consumption, heat output, efficiency). Based on all of the above, a review certificate has to be produced and recommendations made to remedy shortcomings.

4.2 Energy costs

Based on 2008 data institutions consumed an overall quantity of 5.54 million cubic metres of natural gas, 7.68 million kWh of electric energy, while institutions connected to the distant heating network consumed a total of 108 282 GJ of thermal energy. The cost of natural gas consumption was close to 560 million HUF, while the annual cost for electricity consumption was around 310 million HUF. Thermal energy cost 324 million HUF. Overall energy expenses were as high as 1194 million HUF. This significant expense item justifies that an analysis is prepared with regard to the utilization of different types of energy. In the course of the analysis different specific consumption data (compared to the volume of air heated) will be determined, in order to enable that consumption of the different institutions can be compared.

4.3 Proposals for energy rationalization

4.3.1 Rationalization of thermal energy use.

Reduction of thermal energy use using measures not requiring any funds to be spent and using solutions requiring the availability of funds.

Energy conscious behaviour **requiring no funds**

The level of comfort of a person using certain rooms depends on a number of factors. The factor potentially deemed to be of the highest importance is air temperature in the given room. The desired temperature for a room evolves over a longer period based on becoming accustomed to prevailing conditions. Since however the desired internal temperature has a significant impact on thermal energy consumption, it is recommended to promote that lower levels are accepted.

How can this be done? Primarily, it is important that the temperature measured should be of significance for the persons living or residing in the premises. An adequately placed thermometer has to be put up in all rooms! The positioning of the thermometer is an important aspect: it has to be put up in a height of 1.6 meters from the floor, in a spot not exposed to any draught or direct sunlight in any part of the day. The cold feeling associated with windows should be eliminated through the use of curtains. Radiators should not be covered and no objects should be placed on top them. If possible, we should aim for adequately organizing air flow through the radiator using flow regulators.

In respective literature the solutions and method described herein are referred to as the energy conscious use of a given building.

What should be considered as "adequate temperature"? An air temperature of 18-22°C is recommended for rooms of the different institutions, depending on whether these are health and social institutions, cultural institutions or schools and educational institutions.

The specified temperatures are valid for the time of the persons serviced entering and residing in the room. If possible, it has to be ensured that the room temperature, which increases, due to the body temperature, in case of a person residing in the room for a longer period, is adjusted, and not through opening a window, but through regulating heating! The extent to which a periodically used classroom, a library, or student home room or shower is in use is usually known, but can, at any rate, be programmed, and consequently can be regulated using thermostatic radiator valves or a central thermostat.

This solution can contribute to promoting an energy conscious use of the building on the part of all residents of the institutions. According to a generally known relationship, a 1°C average drop in internal temperature reduces heating energy consumption by 6%, and this can be attained with no funds having to be spent (or only an insignificant amount).

Solutions requiring the availability of funds

Proposals can be grouped into the two below categories:

- Proposals belonging to the first group focused on opportunities available to reduce heat loss in the institutions (replacement of windows, wall insulation).
- The other group of proposals focused on connection to the distant heating system of boiler houses suitable for such connection (see Table 4.4.1.2.1.), since this would enable for producing an energy surplus resulting from energy co-generation (thermal energy + electricity).

4.3.2 Heat loss reduction

As could be seen from the previous chapter, institutions are characterised by significant heat losses. Heat loss can be quantified using the specific value of heat exiting through a given surface. This is measured using the heat transmission coefficient, which can be determined for the different institutions based on the heat transfer surface and the thermal energy used for heating. Based on the respective heat transmission coefficient values, the institutions can be grouped into the below categories.

Heat transmission coeff.	W/m2℃	0- 5	5-8	8-10	10+
Number of institutions		44	36	8	15

Number of institutions belonging to the different categories.

According to the previous table, there are a total of 15 institutions, for which the heat transmission coefficient is in excess of 10 W/m^2°C-t, any measures aimed at reducing heat loss have to therefore be evidently commenced at these institutions portraying parameters significantly in excess of the average value (7,4 W/m^2°C). Regarding these 15 institutions, doors and windows were replaced in 2 of them during renovations conducted in 2009. Regarding the remaining 13, bids have been submitted during 2010 in respect f 3 of these institutions in relation to door and window replacement and in 1 instance also for wall insulation. Based on the foregoing, 10 institutions may be designated for door and window replacement, while 13 may be designated for wall insulation to be carried out.

The replacement of existing windows with up-to-date models and the insulation of walls can also be recommended for the remaining institutions, as can the soonest possible compilation and submission of respective bids. Approximate cost and saving calculations have been prepared in respect of the above institutions to show economic impacts. These calculations present the results that can be attained using different amounts of funds spent, but these only serve information purposes, and the decision relating to the detailed appraisal of the institutions and required for bidding should be made, as soon as is possible, as should the detailed thermal engineering calculation stipulated in Decree No. 7/2006 (V. 24.) of the Minister Without Portfolio to be prepared on its basis, since these are indispensable for bidding.

The below basic data were used for calculations:

- In the heating season the average temperature gap between internal and external temperatures is 15.9°C.
- Funds that can be retained through a saving in heat were appraised using the 3000 HUF/GJ specific value.
- Windows account for 60% of heat transmission surfaces.
- On account of the fact that no layer order thermal engineering calculations were available in respect of windows or walls, for our calculations estimates had to be produced for the heat transmission values of existing walls and windows. The estimate used was 1.46 W/m^2°C for walls and 8.7 W/m^2°C for windows.

Regarding the replacement of windows, a simple financial recovery time of 5.16 years can be considered. For wall insulation this period is equal to 13.91 years. According to calculations window replacement would cost 206.1 million HUF, with the cost of wall insulation being equal to the significantly more moderate value of 42.45 million HUF. According to the requirements set for the competition, window replacement and wall insulation has to be conducted simultaneously, since this is a pre-condition for attaining the specific heat consumption values stipulated. In case of joint implementation, the average simple recovery period is equal to 6.65 years, as resulting from the above figures.

Bidding opportunities are discussed in detail in Chapter 7 of this study. If a suitable bid is submitted to the National Development Agency (NDA), the Municipality will be eligible to receive 50% funding, which significantly improves the recovery period. Additionally, expenses could be further reduced, if window replacement and posterior wall insulation would be performed relying on the free capacities of Holding companies.

4.3.3 Electricity rationalization

Updating that may be recommended based on the analyses to be preformed:

- replacement of lights,
- automatic lighting control, reduction of light pollution,
- inspection and replacement, if necessary, of other electricity consumers (electric equipment used in education and other equipment)

The use of LED light sources may be considered for the purpose of light source replacement. The power requirement of LED lights are depicted in the below table:

Power requirement of original bulbs	Power requirement of LED lights	Luminosity of LED lights
150 W	56 W	4200 lm
250 W	112 W	8400 lm
400 W	168 W	12800 lm

Power requirement of LED lights.

The table clearly illustrates that in case the lowest performance (150 W) street bulbs are replaced, a saving of close to 63 % can be attained, while for the highest performance bulbs (400 W) this value is 58%. Based on an annual operation of 2000 hours, the saving in energy consumption for 150 W bulbs is around 188 kWh per bulb. Also comparing the useful life of an ordinary light bulb (1-2000 operating hours) and that of a LED light (30-50000 operating hours) the annual saving in expenses may bas a high as 80-85%.

Regarding electricity generation, solar cell systems are becoming ever more widespread. Based on cost efficiency considerations, today these are still only recommended to be used in locations to which mains electricity is not supplied and thus supplying power is problematic.

Based on the basic materials used, there are a number of different types of solar cells:

- Mono-crystal silicon (Si) solar cells: expensive, but efficient,
- Poly-crystal silicon (Si) solar cells,
- Amorphous solar cells: cheaper,
- Metal-semiconductor-metal structures: dye sensitized semi-conductor oxides,
- Amorphous semiconductor layer solar cells,
- Solar cells manufactured of organic substances (polymers): cheap.

The average efficiency of solar cells is around 10-20%. Poly-crystal solar cells have the highest efficiency of around 20%. The efficiency of solar cells produced using organic substances on the other hand, is only around 2-5%.

A unique feature of solar cells is that, if installed in a fixed location, they are only capable of producing electricity over a period of 6 hours. If utilization requirements are higher, it is required that solar cells are rotated or their inclination changed during the day.

It is also often necessary to also install storage buffers for solar cells, since they do not generate electricity at an even rate.

Characteristic prices for systems relying on poly-crystal solar cells (including support structure, inverter, cabling) are:

1.1 kW	4500 EUR
2.1 kW	7700 EUR
3.15 kW	11300 EUR
10.08 kW	36300 EUR

Regarding the appraisal of electricity generation using solar cells, the following statements can be made:

- The annual electricity consumption of an average detached family home is around 3500-4000kWh.
- Approximately 50% of this value could be generated using a solar cell system.
- The installation of a solar cell system of such magnitude could cost as much as 3-4 million Hungarian Forints.
- Such an investment however, could not be recovered within a foreseeable period of time, if the price of electricity more or less remains similar to that of today.

5 THE FUTURE OF THE CITY'S ENERGY MANAGEMENT

5.1 Changes in the legal environment

Issues related to the sale of co-generated thermal energy and electricity are of highlighted significance regarding the city's energy management. According to changes in legal regulations, the statutory electricity takeover benefit enjoyed by the Diósgyőr gas engine power plant, the Tatár Street gas engine power plant, the Bulgárföld gas engine power plant and the Hold Street Combined Cycle Heat Generation Turbine Power Plant expire on 28 February 2014, on 30 June 2013, on 31 December 2015 and also on 31 December 2015, respectively.

Meanwhile, non-beneficial processes are also characteristic of the electricity system.

- As compared to 2008, in 2009 domestic electricity consumption fell by 5.5%, electricity produced by domestic power plants decreased by 10%, with the import-export balance increasing by 41%.
- Capacity utilization in large combined cycle power plants was reduced from the previous 60% to 40%, despite of the fact that the Statutory Electricity Takeover Act provided protection against certain unfavourable market impacts.

Capacity utilization of the 200 MW blocs of the Dunamenti and Tisza power plants was only between 14-19%.

On account of the above processes the electricity system will only be prepared to takeover electricity produced (including electricity co-generated) according to conditions less favourable than applied previously, since the surplus capacities available in surrounding countries allow for cheaper electricity purchases to be effected. This implies that if no appropriate measures are implemented, MIHŐ Kft will only be able to offer the distant heating service to customers at a higher price, which would negatively impact general opinion concerning the distant heating service in an extent that should not be allowed.

The following technical, economic and communications opportunities need to be applied to avoid the above circumstances:

- Statistics show that demand for electricity in the summer is slowly approaching winter demand, owing to rapid growth in the popularity of air conditioners. Since the demand for electricity is growing, an according benefit may be exploited by MFÜ Kft. The capacity utilization of the power plants operated by MFŰ Kft is less during the summer period. It would be worthwhile to offer surplus electricity during off-peak periods (during the morning

and, if possible, the afternoon peak), relying on the more beneficial off-peak (and/or peak) tariff.

- If a storage buffer is created, this can be filled up during the night time off-peak period, then emptied during the peak period to enable lower price electricity sales. Naturally, this implies that the annual costs related to the creation of such buffer storage also need to be reckoned with.
- The launching of national level protesting is necessary (preferably led by the National Association of Distant Heating Providers or the Hungarian Co-Generated Energy Society), for raising awareness to the conditions necessary for providing an economic distant heating service disappearing.

5.2 Expedient development directions

5.2.1 Technical energy supply proposals

The fundamental objective of energy management in institutions is to ensure a secure energy supply at the lowest possible cost. The essence of energy management is to assess whether the given level energy consumption is justified, and to take appropriate measures in case of excessive consumption. This can be implemented, if adequate information is available, if all stakeholders are adequately informed and if measures can be taken in an institutionalized manner, i.e. if a central energy management system is in operation.

The energy management system has to provide for the following tasks:

- to ensure the collection of energy consumption and other necessary data with an appropriate frequency,
- to enable for data to be realistically appraised, including:
    - The comparison to each other and ranking of the different institutions.
    - The realistic appraisal of energy costs.
    - Ensuring that all stakeholders receive adequate information; it is important that all institutions can become familiar with their own energy management activities
    - Enabling effective intervention in case of significant excess consumption.
    - Support for determining and planning interventions and investments aimed at efficiency improvement.
    - Serving as a basis for calculating the success of efficiency improvement measures.

- Promoting the realistic planning of energy costs. Coordinating energy purchases, as well as the tenders and public procurement procedures related to market liberalization, for the purpose of finding the lowest possible purchase prices.
- Submitting bids to the NDA for winning appropriate financial assistance

5.2.2 Institutional changes

The magnitude of energy costs and the quantity of institutions make it worthwhile to appoint a separate energetics unit, which is recommended to be created within the organizational framework of MIHŐ Kft. This organization would be charged with the following tasks:

- operation of a register containing the energy related data of the different institutions,
- organization of energy related data provision to be undertaken by the institutions,
- continuous uploading of energy consumption data to the database,
- central organization of service contracts; ensuring availability of institutions for the actual conclusions of contracts,
- continuous monitoring of price regulations and tariff changes, and the compilation of methodology sample calculations and recommendations in case of any changes,
- calculation of specific energy consumption indicators for the different institutions, monitoring of the ranking of specific values for the institutions, as well as their comparison,
- continuous energetics qualification of the institutions,
- implementing or contracting specialists for energy loss appraisals,
- preparation of support materials for institutions on the topic of energy efficiency improvement opportunities,
- consultancy to institutions regarding actual energy efficiency issues,
- review of the energy cost budgets and investment plans of institutions,
- supervision of the energy efficiency investment programme (e.g. organization of competitions, evaluation of bids, follow-up inspection of investments implemented).

If the energy management system is operated by a separate organization responsible, opportunities are available to manage very efficient and detailed data registers and to conduct evaluations.

Data recommended to be collected in future:

- Basic particulars of institutions:
- Basic geometric and staff data, contact information, types of energy contracts (according to current circumstances, this has been performed by MIHŐ Kft., the review and disambiguation of which is currently in progress).

- Energy consumption data: Recommended to be initially collected on a monthly, then later on, on a weekly basis. This is a future task of highlighted significance. A solution has to be found, according to which a person responsible for reading these data and for forwarding these to the designated energy management organization has to be appointed at every institution.
- Temperature data: The collection of these in future on a daily basis is necessary, in order to facilitate the comparison of data in upcoming years. These on the one hand include external temperature data (which are already being collected by MIHŐ Kft), on the other hand including measurement of the internal temperatures of the selected premises of the different institutions. For conducting this task an employee of the institutions is likewise recommended to be appointed.

The energy management organization has to be made entitled to carry out unannounced ad hoc inspections. The coordination of the above tasks, the compilation of sample forms and their completion should be entrusted by the Municipality of Miskolc, Town of County Rank to MIHŐ Kft.

Regarding energy purchasing, the below requirements need to be taken into consideration in respect of the institutions of the Municipality of Miskolc, Town of County Rank

Pursuant to the major provisions impacting the municipality of Act XL of 2008 on natural gas supply:

- As of 1 July 2010, contracts may only be concluded according to open market conditions for institutions contracting gas supply in excess of 20 cubic metres per hour.
- If the municipality does not take advantage of any of the opportunities described in Subsection a., the existing natural gas public service provider shall act as the open market trader and replace the public service provider, using the open market prices quoted by such provider. (MIHŐ Kft. does not recommend for this solution to be chosen, since this may result in a less favourable price).
- Consumers of a consumption of below 20 cubic metres per hour will also in future remain to be eligible to contract a universal service, but the opportunity to conduct the public procurement procedure described in the previous section is also available to these consumers (MIHŐ Kft. recommends for universal service contracts to be maintained also in case of these consumers). Legal regulations also allow for universal service contracts to be terminated and the switch made to the open market at a future date.

Based on the natural gas acquisition scheme chosen by the municipality, MIHŐ Kft. will centrally coordinate natural gas purchases, if so authorized by the municipality.

Regarding electricity acquisition, the entitlement of the Municipality of Miskolc, Town of County Rank to contract universal services in a volume necessary for meeting its public liabilities is laid down in legal regulations.

Additional recommendations related to institutional changes:

- It should be investigated according to what conditions the boiler houses operated by the different institutions can be transferred into the ownership of MIHŐ Kft, based on current economic circumstances. Following such ownership transfer to MIHŐ Kft. and after obtaining a distant heating supply permit, invoicing could be performed at distant heating tariffs and with a 5% VAT added. Under such circumstances MIHŐ Kft. could continuously modernize outdated boiler houses and the municipality would only be have to settle the distant heating service tariffs.
- The contracting of MIHŐ Kft. for the full operation and maintenance of the boiler houses of institutions would be worthwhile, even if the above solution is not feasible, since according to current circumstances different contractors applying different conditions are in charge of operations in a number of cases. This situation has to be resolved, as soon as possible.
- Regarding this issue, a decision would be required to be made during 2010, with its implementation commencing, as of 1 January 2011.

6 ENVIRONMENTAL IMPACTS

Although in a global sense energy use is also responsible for certain instances of ground and water pollution, impacts to which local and international obligations are applicable are primarily related to air pollution. Consequently, these will be investigated in this document,

From a global aspect, the Kyoto Protocol is of significance fundamentally from the point of view of CO_2 emission. The quantity of carbon-dioxide emitted into the atmosphere annually as a result of the energy use of the town of Miskolc is 1.1 million tons, as according to the figures contained in the energy balance previously presented. Naturally, a certain proportion of this quantity is not locally produced, since the electricity used is generated in power plants located farther away, but the quantity produced as a result of local emission is still a considerable 622 thousand tons of CO_2.

As far as local impact are concerned, the emission of other pollutants and local air quality characteristics are of greater significance. In general, it may be stated that in recent years air quality in Miskolc has considerably improved, which is in line with domestic trends.

In recent years, the reason for there being a reduction in industrial environmental pollution was that a line of industrial plants have discontinued operations, which also resulted in respective emissions ceasing. Last year however, not only were plants closed down, but there were also plants constructed and commencing operations, which conduct respective activities in an environmentally friendly manner. These are predominantly plants of larger international companies employing up to date technologies and environmental systems. However, the situation is not so evidently favourable, if we consider newly established small industrial plants.

Air pollution resulting from transportation has fundamentally remained unchanged in recent years, although favourable trends result from the vehicle fleet becoming more up to date, the number of vehicles fitted with a catalytic converter increasing and the exclusive use of unleaded fuels. However, the almost constant increase of traffic, as far as both local and transit traffic is concerned, is a negative impact.

Based on the air pollution parameters measured in Miskolc, it can be confirmed that during the non-heating semester Miskolc belonged to the 1^{st} category (settlement of suitable air quality) regarding sulphur dioxide, the 2^{nd} category (moderately polluted settlement) regarding nitrogen oxide and the 3^{rd} category (polluted settlement) regarding ambient dust. During the heating semester sulphur dioxide pollution is higher, belonging to the 2^{nd} category (moderately polluted settlement). The

percentage ratio for exceeding limit values applicable to nitrogen oxide concentration remained unchanged, as compared to the previous year, and also belonged to the 2nd category. The quantity of ambient dust was very high in the city all through the year, so 3rd category classification also remained valid for the heating semester.

The large number of instances of exceeding limit values shows that additional efforts are needed in Miskolc for reducing air pollution. Regarding energy management, the following measures may be implemented for the purpose of reducing future environmental loading.

- Promotion of connection to the distant heating system, as opposed to individual heating solutions.
- A further solution opportunity is that household and industrial consumers currently using solid fuels should make the switch to distant heating or to natural gas fuelled solutions.
- The most significant impact would result from there being a massive shift to renewable energy sources (biomass, geothermal energy, heat pumps, solar energy). Favourable bidding opportunities are available for the application of these technologies, which ensure that the investment expenses required for making such a switch can be reduced. Following the switch made, energy expenses can become much more favourable than that for natural gas fuelled solutions.

7 COMPETITION OPPORTUNITIES

In relation to the energetics concept, MIHŐ Kft and the Municipality of Miskolc, Town of County Rank has an opportunity to submit bids to the competition schemes entitled "Energetics modernization of the distant heating sector", "Building energetics development and public lighting modernization" and "Meeting local heating and cooling demand using renewable energy sources" organized by the National Development Agency (NDA) in the framework of Priority 5: "Efficient energy use" of the Environment and Energy Operative Programme (EEOP). The activities that may be assisted, the conditions applicable to bidders, the grounds for disqualification, the types of expenses eligible for assistance and the financial conditions applicable to the distant heating sector and to building energetics developments are presented in the following chapters.

7.1 Distant heating supply (code of current invitation to bid: KEOP 5.4.0)

According to the invitation to bid, distant heating providers are only eligible to submit a bid, if disposing of a distant heating provision license. No assistance may be awarded to bidders in the case of which average annual net sales revenues before tax generated reached or exceeded the sum of 100 million Euros.

Additional grounds for disqualification from bidding are:

- no assistance may be awarded to bidders not meeting administrative requirements (having public debts outstanding, not having complied with requirements set for other assistance, in case of any court rulings against the bidder in relation to unfair market behaviour or any labour lawsuits, etc.),
- authorized capital of the organization fell to below the minimum requirement,
- professional incompetence of the bidding organization.

The list of activities eligible to receive assistance are:

- Waste heat utilization
- Replacement of primary long distance heating lines, thermal insulation of above-ground lines
- Modernization of user heat centres
- Establishment of a variable mass flow system
- Energy efficient updating of boilers
- Connection of new customers to the distant heating system

- Creation of heat and electricity co-generation facilities, with electricity exclusively used for own purposes

The construction of new structures may only be assisted, if this is necessary for the purpose of connecting new customers to the distant heating system or for the creation of heat and electricity co-generation.

No assistance may be awarded, if the distant heat supplier sells electricity generated through heat and electricity co-generation, or if distant heating is not directly supplied to households or to public utilities based on individual contracts.

Assistance may be awarded in a value between the minimum and maximum amounts of 10 million HUF and 500 million HUF.

Project expenses are required to be itemized and controllable. Expenses related to the assisted project are exclusively eligible for assistance.

Requirements applicable to the maximum values for different expenses:

- Preparations 6 %
- Purchase of real property or land 10%

Investment Million HUF	0-49.999 million HUF	50-99.999 million HUF	100-299.999 million HUF	300-1 billion HUF	1-4 billion HUF	Over 4 billion HUF
Management	8% max 2.5 million HUF	5% max 4 million HUF	4% max 9 million HUF	3% max 20 million HUF	2% max 40 million HUF	1% max 60 million HUF

Level of assistance

From amongst investment costs, many expenses are not eligible for assistance. These are the following:

- Vehicles
- Used equipment
- Residential buildings
- Office software
- Acquisition of shares
- Insurance
- Losses
- Foreign exchange commission
- Fines
- Translation

- Interpreting

Preparation of the bidding documentation is aided by appropriate guides. A detailed Feasibility Study in line with requirements is required to be attached to the bidding documentation and expenses have to be backed up by price quotations. The Feasibility Study has to present a line of efficiency indicators, as well as the energy savings attained and the reduction in CO_2 emission.

7.2 Building energetics, lighting (code of current invitation to bid: KEOP 5.3.0 A)

Potential bidders may include business corporations, budgetary bodies and other organizations (with a few exceptions). Organizations for which agricultural activities account for 50% of their net sales revenues are not eligible to bid. The grounds for disqualification listed in Section 7.1 also apply (administrative requirements, etc.).

The list of activities eligible to receive assistance are:

- Posterior external thermal insulation
- Replacement of external doors and windows
- Heat recapturing ventilation
- Boiler replacement
- Installation of automatic regulators
- Ensuring the controllability of sanitary hot water systems used for heating
- Formulation of small scale local co-generation
- Waste heat utilization
- Modernization of heat distribution systems
- Connection to the distant heating system
- Energetics modernization of technological equipment (catering, washing, drying, ironing)
- Replacement of light sources and fixtures
- Sectioning of external and internal lighting systems, installation of movement sensors

The construction of new structures may only be assisted, if this is necessary for the purpose of connecting new customers to the distant heating system or for the creation of heat and electricity co-generation.

Assistance may be awarded in a value between the minimum and maximum amounts of 1 million HUF and 500 million HUF.

Project expenses are required to be itemized and controllable. Expenses related to the assisted project are exclusively eligible for assistance.

Requirements applicable to the maximum values for different expenses:

- Preparations 6 %
- Purchase of real property or land 10%

Investment Million HUF	0-49.999 million HUF	50-99.999 million HUF	100-299.999 million HUF	300-1 billion HUF	1-4 billion HUF	Over 4 billion HUF
Management	8% max 2.5 million HUF	5% max 4 million HUF	4% max 9 million HUF	3% max 20 million HUF	2% max 40 million HUF	1% max 60 million HUF

Table 7.2.1. Level of assistance

- From amongst investment costs (listed in Section 7.1), many expenses are not eligible for assistance.

7.3 Meeting local heating and cooling demand using renewable energy sources (code of current invitation to bid: KEOP 4.2.0 A)

The list of activities eligible to receive assistance are:

- Conducting an energetics audit prior to project implementation and seeking auditor approval after implementation
- Preparation of a building energetics calculation and issuing of a building energetics certificate
- Installation of a solar panel system
- Formulation of a solid biomass fuelled energy system
- Installation of heat pump systems

Other conditions valid for the competition are fundamentally identical to those listed in the above two sections.