



**ALLIANCE TO SAVE ENERGY**

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**Municipal Network for Energy Efficiency**

# Regional Urban Heating Policy Assessment Part I

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## FOREWORD & ACKNOWLEDGEMENTS:

*In the present assessment, the Alliance together with USAID and selected experts tried to define, analyze and present an integrated, comprehensive assessment of urban heating sector condition, policies and programs in the Europe & Eurasia (E&E) region. The assessment is meant to help donors and policymakers understand the key issues related to urban heating – now and into the future, and to factor those issues as appropriate into their respective policies, programs and strategies. The expanded audience for this assessment includes local governments, energy experts and project developers, non-governmental organizations (NGOs) and others who influence the development of the E&E region. Part I of the present document provides the regional, cross-country assessment of urban heating sector issues, policies, experiences and recommendations for reform and restructuring. Part II of this assessment presents a compendium of country papers providing an in-depth review of the above issues on a country level (available on [www.munee.org](http://www.munee.org)).*

*The authors are grateful to the remarkable group of experts who contributed their time and expertise to helping make the presented book inclusive and reflective of the true picture in the urban heating sector in the Central and Eastern Europe and Commonwealth of Independent States.*

*Experts and organizations from numerous countries throughout the region have authored the supporting country briefs, sections of which may appear in the integrated regional synthesis presented. Most of the data for the enclosed analysis was collected in 2004. The team involved in the data collection and analyses on country levels consisted of the following prominent experts and organizations:*

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# Acronyms

|                |  |
|----------------|--|
| <b>ASE</b>     | Alliance to Save Energy  |
| <b>BIH</b>     | Bosnia and Herzegovina   |
| <b>CEE</b>     | Central and Eastern Europe   |
| <b>CENEF</b>   | Center for Energy Efficiency (Russia)                                  |
| <b>CHP</b>     | Combined Heat and Power (also referred to as cogeneration)             |
| <b>CIS</b>     | Commonwealth of Independent States                                     |
| <b>DH</b>      | District Heating   |
| <b>DHC</b>     | District Heating Company   |
| <b>DHS</b>     | District Heating System  |
| <b>DSM</b>     | Demand Side Management   |
| <b>E&amp;E</b> | Europe and Eurasia   |
| <b>EBRD</b>    | European Bank for Reconstruction and Development                       |
| <b>EE</b>      | Energy Efficiency  |
| <b>ESCO</b>    | Energy Service Company   |
| <b>EU</b>      | European Union   |
| <b>EUR</b>     | European Union Currency Euro also marked as €                          |
| <b>GDP</b>     | Gross Domestic Product   |
| <b>GEF</b>     | Global Environmental Facility  |
| <b>HCA</b>     | Heat Cost Allocator  |
| <b>HEP</b>     | Hrvatska Elektro Privreda (Electricity Company of Croatia)             |
| <b>HOA</b>     | Home Owner Association   |
| <b>HOB</b>     | Heat-only boiler   |
| <b>IFC</b>     | International Finance Corporation                                      |
| <b>IFI</b>     | international financial institution                                    |
| <b>IRR</b>     | Internal Rate of Return  |
| <b>JSC</b>     | Joint Stock Company  |
| <b>Ltd.</b>    | Limited company  |
| <b>MUNEE</b>   | Municipal Network for Energy Efficiency                                |
| <b>NPV</b>     | Net Present Value  |
| <b>O&amp;M</b> | Operation and Maintenance  |
| <b>PPP</b>     | Private – Public Partnership   |
| <b>PSP</b>     | private sector participation   |
| <b>TRV</b>     | Thermostatic Radiator Valve  |
| <b>UNDP</b>    | United Nations Development Program                                     |
| <b>USAID</b>   | United States Agency for International Development                     |
| <b>USD</b>     | United state dollar (also marked as US\$ or simply \$)                 |
| <b>VAT</b>     | Value Added Tax  |
| <b>WB</b>      | The World Bank (International Bank for Reconstruction and Development) |

## Units of Measure

|            |                               |            |                            |
|------------|-------------------------------|------------|----------------------------|
| <b>GJ</b>  | giga joule = $10^{12}$ joules | <b>MW</b>  | megawatt = $10^6$ watts    |
| <b>km</b>  | Kilometer                     | <b>MWh</b> | megawatt hour              |
| <b>kW</b>  | kilo watt                     | <b>t</b>   | tons                       |
| <b>kWh</b> | kilo watt hour                | <b>TJ</b>  | tera joule = $10^9$ joules |

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# Executive Summary

Where the urban heating sector is concerned, the countries of Central and Eastern Europe (CEE) and the Commonwealth of Independent States (CIS) have many similarities but also many differences. The direct use of fossil fuels and electricity for heating is predominant in Bulgaria, Macedonia, Armenia, Albania and Georgia, while in Russia, Latvia, Poland, Ukraine, Lithuania and Belarus the district heat sector remains the predominant residential heat supplier with old, pre-transition district heating (DH) systems. In Poland approximately 70% of the heat demand in towns (about 46,000 MW) is covered through DH networks supplied from combined heat and power (CHP) and heat-only boiler (HOB) plants with a thermal capacity over 70,000 MW. However, heat demand in rural areas and small towns is mainly covered by local (often individual) heat sources. In Croatia and Armenia there are well-developed gas supply networks, and the share of natural gas in the final energy consumption of households is continually increasing. Oil products and electricity are broadly used, while the share of firewood is progressively diminishing. Decentralized heating options are developing extensively, filling a growing market niche in the urban heat supply and competing with district heating. Fuel import reliability and rising prices have a growing impact on the viability of various heating options, often posing a national energy security threat with various economic, social and environmental consequences.

In the former economic system, District Heating Companies (DHCs) were state-owned and centralized. Under centrally planned economies, dozens of large DHCs operating hundreds of heat sources and DH networks existed in different cities. Heating tariffs were set by the government, with tariff subsidies often comprising more than half of the heating tariffs, which were already set below cost-recovery level. Consequently, those companies continually lacked funds for operations and maintenance (O&M), retrofits and quality assurance. Over time, the pressure for change in the heating sector and the demand for better service quality and reliability created the need for reform, in the form of general energy sector restructuring and the commercialization of utility services.

The countries of CEE were more successful in integrating the urban heating sector into the national policy agenda, while in the countries of CIS the heating sector is regularly ignored in discussion of national energy policies. This happens in spite of the fact that the heat sector in the CIS region accounts for between 20% to 45% of all domestic energy consumption and about 20% to 50% of fossil fuel use. The old and oversized district heating systems in the transition economies serve roughly 250 million people in Eastern Europe and the Former Soviet Union. In many places, the district heating systems need substantial modernization and restructuring to eliminate large network losses, introduce control and metering, and improve the efficiency and automation of generating capacities. There is also a need in urban areas for an analysis of all possible heat supply options, with DH maintained in those places where it is cost-effective, provides fuel flexibility, and allows for the utilization of waste heat and cogeneration. Municipal energy planning has a vital role in optimizing the supply of different heating options in urban areas.

Regardless of the fact that the deficiencies of central heating systems are well known and have been analyzed and documented many times, little has been done to eliminate these problems on the ground in most of the countries of CIS and Balkans. Lack of incentives for energy efficiency coupled with lack of financing left this sector without much attention, which resulted in further deterioration of technical structures, resulting in poor service quality and low payments, further hampering the ability of heating enterprises to carry out routine maintenance and repairs. Potential social, health and safety impacts of long-term failures in the supply of central heat—as well as the heavy financial burden on municipal and state budgets, constant political pressure, and escalating fuel prices—motivated the governments to acknowledge the need for reform in this sector as a high priority.

In the CIS and Balkans, the public sector still predominantly maintains municipal ownership of heating assets. The earliest efforts in past years have focused on reforming the legislation, introducing market principles, creating independent regulation, and gradually eliminating subsidies. Little has yet been accomplished in the next phase of reform that involves steps such as establishing service quality requirements, creating a favorable investment climate, providing incentives for energy efficiency improvements, and attracting private sector participation. Hence, most of the aforementioned technical problems still remain acute in the region. Moreover, some of these countries – Russia,

Ukraine, Belarus, and Central Asian Republics – still have a very high share of district heat and the need for reform is acute to help make heating service cost effective, because climate conditions, high population density, growing housing stock and industrial heat demand make DH a desired heating source. Conversely, in Moldova, Albania and countries of the South Caucasus, prolonged poor maintenance and underinvestment in the sector has left DH systems either on the verge of collapse or completely collapsed. In their place, decentralized small heating systems or individual apartment heating schemes have been developing haphazardly. The heat markets in other countries of Southeast Europe, such as the ex-Yugoslav Republics, also have degraded DH systems combined with growing decentralized heating.

The CEE countries, which have now become EU members, were more successful in reforming and restructuring the heat sector, transferring ownership and management of DH assets, and opening the heating sector for private participation and investment, which resulted in commercialization and improved efficiency of the heat service.

The experiences of these countries, particularly Hungary, Czech Republic, Poland, Bulgaria, and the Baltic States, are analyzed in the present report to draw lessons and recommendations for the less successful reformer countries in the region.

The key issues requiring immediate intervention from policymakers and donor agencies in order to improve the viability and continued development of district heating in the transition economies of the CEE & CIS, while also contributing to the elimination of technical deficiencies, are as follows:

***Discriminatory pricing mechanisms:*** subsidies, cross-subsidies, below cost-recovery tariffs, and other pricing limitations create market distortions that hamper the cost-recovery, viability and competitiveness of the district heating sector.

***Competition with other heating options:*** District heating networks are encountering competition from more flexible and currently cheaper heating options such as natural gas. The speed with which gas supply networks are being developed to reach individual households poses an immediate threat to district heating because consumers see gas as a more reliable and affordable heating option offering better consumer control over indoor temperature and consumption levels. However, in the long run, district heating would be a more affordable and energy-efficient heating service if it were appropriately sized, metered, regulated on the supply and demand sides, and maintained in good repair.

***Lack of Energy Planning:*** The heat sector must be integrated into the energy policy agenda, for example by including urban heating into local energy planning and mandating connection to DH systems, where available.

***Lack of Finance and Investment:*** Lack of financing, including investment funds and incentives that improve the general business and investment climate for private sector participation (PSP), energy efficiency upgrades and the introduction of environmentally friendly technologies.

***Lack of local expertise and awareness:*** Painful mistakes in the heat sector reform process often result from insufficient knowledge of: privatization options, management approaches, innovative financing mechanisms, the unique features of the heat market compared to electricity and gas, common pitfalls to avoid, and most importantly, restructuring strategies and programs and successful replicable models from the region.

***Imperfect Social Safety Mechanisms:*** Increasing utility bills due to growing fuel prices and elimination of subsidies place a major burden on the low-income households. Lack of targeted social assistance, coupled with the lack of demand-side metering and regulation, can make poor consumers non-payers. This, in turn, further diminishes the cost-recovery of heat suppliers, triggering a long chain of negative consequences – bad O&M, low efficiency, large losses, poor service quality, further tariff growth and larger affordability problems.

***Weak Environmental Regulations:*** Lack of strict environmental regulations and low prioritization of DH/CHP as a strategic environmental objective made the sector vulnerable to competition and failed to provide incentives for efficiency improvements, modernization and emission reductions.

***Supply-side bias:*** Supply-side policy bias with insufficient consumer orientation is a common mistake in the early stages of reform. In the absence of proper end-use control and metering, the



investments made in the generation facilities will not be recovered due to poor customer satisfaction and non-payment.

### **Losses and Inefficiency**

With the average fuel efficiency of district heating in the region ranging from 55% to 90%, and transportation and distribution losses ranging from 15% to 70%, it is critical that the energy performance of end users—such as internal heating networks, buildings' thermal insulation, and thermal regulation and control—be as high as possible. Real economic effects—improved efficiency, reduced losses, lower fuel consumption, decreased pollution and lower heat supply costs—can only be achieved through well coordinated actions by all entities involved in the heat supply and end use process. Introduction of demand-side metering and control should either follow or be implemented concurrently with supply-side metering. This will promote efficient combustion and generation technologies on the supply-side, resulting in energy and cost savings of up to 30%, while also providing other opportunities to reduce generation costs, such as the introduction of cogeneration and the minimization of distribution costs through the use of pre-insulated pipes. Growing tariffs combined with metering and control on the demand-side will create incentives for insulation in walls, ceilings and floors; energy efficient windows; and weather stripping on windows and doors.

### **Heat Cost Recovery and Affordability**

Cost recovery and heat tariffs have changed substantially during the past 16 years – in some countries of the region, such as Poland, Hungary, Latvia, and Bulgaria, subsidies were fully or partially eliminated. The opening of the heating industry to private capital and ownership has introduced a business into the heat supply service, more aggressively pursuing collections, cost-recovery and efficiency. Higher prices encourage energy efficiency investments; however they also raise major social concerns if not combined with targeted social and weatherization assistance for low-income households.

Other countries still partially maintain subsidies and cross-subsidies, including the largest DH nations Russia and Ukraine, as well as Belarus, Moldova, the Central Asian Republics, Bosnia and Serbia. Chisinau households in Moldova pay about 40% of the heat price, the municipality pays the rest. In a few countries, the transition was made to two-tier tariffs. Low and subsidized energy prices in some key countries continue to render energy-efficiency investments non-competitive for the most part, and to favor decentralized energy supply alternatives.

Competition plays a limited role in determining district heating prices across the region. The Czech Republic, Estonia, Hungary, Lithuania, and Poland, as well as several large Western European nations, still practice cost-plus pricing. The Czech Republic and other nations, however, have recently adopted a more flexible approach to pricing which sets caps on tariffs and allows flexibility in pricing as a way of creating incentives and possibly competition. In general, national regulatory authorities set these tariffs.

Centralized tariff-setting decisions—that is, by national regulators rather than municipalities—and the elimination of subsidies without a well-designed social safety net to compensate, has in many cases had tangible deleterious impacts on low-income households. Because of increasing fuel prices in recent years, the real cost of heat (as opposed to the price consumers actually experience) has risen at least as fast as economic growth if not faster. As the economies in most of the non-accession countries in the region have not yet regained their pre-transition GDP levels,<sup>1</sup> the ability of people to afford heat has generally been declining. Average household expenditures on central heating range from 1% to 18%, while this share is 3 to 4% higher in low-income households; the general consensus on the limit of affordability for heat is 10%. Given that subsidies have not been fully eliminated in many countries of the region, the DH prices do not even reflect the true cost of service, and as subsidies are eliminated heat supply will become even less affordable. In the absence of demand-side management in DH, low-income people can only pay for a low level of comfort; hence their choices are either low-quality district heat or direct combustion of other fuels. Low affordability of DH has

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<sup>1</sup> Based on the most recent (2006) EBRD Transition Report, GDP levels are still below 1989 levels in Bosnia & Herzegovina; Macedonia; Montenegro; Serbia; Russia; Azerbaijan; Georgia; Moldova; Ukraine; Kyrgyzstan; and Tajikistan.

been a primary reason for the rapid growth of other heating alternatives. In places, where DH is not available, such as Albania and Moldova, the energy cost for one type of fuel often ranges from 15% to 30%, which is significantly over the commonly accepted affordability limit. The transition economies include some of the poorest countries in Europe and heating bills are a major burden on household budgets.

Social assistance has not been adequately incorporated into the heat sector to cover the social consequences of eliminating heat subsidies. Substituting heat subsidies with targeted assistance for low-income families has generally been the best practice in countries in the advanced stages of heat sector reform. This will help maintain them as DH customers, improve collections, and most importantly allow for heating options that are efficient, safe, environmentally friendly and affordable for such families. These, combined with the installation of demand side management (DSM) tools – individual heat metering and regulating devices – can provide DH with the flexibility needed to retain DH consumers. The elimination of heat subsidies should also be accompanied with weatherization programs for low-income households in order to reduce heating bills in the long-term. A parallel study “Addressing Affordability of Utility Services in Urban Housing: Energy and Water Efficiency Solutions” by the Alliance to Save Energy addresses these issues in more detail.

Cross-subsidies between consumer groups produce a market distortion, irrespective of the group paying a lower price,. Commercial and industrial consumers often pay a higher price for heat (e.g. in Russia), which creates an incentive for such consumers to disconnect and find alternative, cheaper heat supply options. In cases where residents subsidize industry, such as Serbia and Romania, the more affluent households disconnect from the community heating system and install individual heating systems for their apartments, leaving a higher proportion of poorer customers connected to the system, which results in lower overall collection rates.

Cross-subsidies between fuels or in other utilities, such as gas or electricity, are also counterproductive. Such cross-subsidies have caused massive disconnections from DH, which would not have happened in the absence of price discrimination (e.g. the Ukrainian city of Horodok). The market distortion caused by the higher gas price paid by DH companies made DH significantly more expensive than direct-gas heating under a lower household gas price, for example as seen in Estonia, Latvia, Romania, Poland, Ukraine. In Romania, until disconnections were made impossible in October 2006, cheaper prices for household gas led massive groups of consumers to disconnect from DH and install individual apartment boilers to reduce heating bills.

To avoid haphazard disconnections resulting in economic inefficiencies, as well as technical, environmental and safety concerns, a procedural framework is needed. This can be provided through zoning or municipal heat planning (as in Estonia), assigning heating options to different urban areas depending on techno-economic features such as least-cost, population density and the length of the heating season. As an alternative, to mitigate the impact of disconnections on the stability of existing, operational systems, a procedural framework can be instituted avoiding single household cases, but rather demanding larger consumer groups to make a decision. In Poland for example, in order to disconnect an apartment in a multi-apartment building the permission of the other owners is required. Also, safety, construction norms and environmental regulations should be in place to ensure secure competition between heating options.

### **Industry Structure, Investment and Competition**

The evolution of energy sector policies and fuel markets in the CEE and CIS region have greatly affected the heat market. New institutional and ownership models have appeared, along with new technical solutions. Competition, rising fuel prices, social issues, the gradually depreciating district heating assets and poor service quality were all ingredients for the loss of popularity of DH under new market conditions which did not limit consumer choice. This contributed to the growing market niche for decentralized heating options. In this historically DH-dominated region, electric and natural gas-fired individual heating have grown in market size. The re-distribution of market shares is gradually slowing down: DH maintained a smaller but cost-effective share of the market, and wherever DH was not competitive, decentralized building-level heat supply is gradually strengthening its role in the conquered market niche. The quality and efficiency of heating options chosen has significantly depended on access to affordable finance, coupled with effective price setting, service availability and quality, consumer awareness, as well as laws and standards governing energy efficiency in heating systems and buildings. In most cases, lack of investment capital causes

inefficiency, high losses, poor administration and management, and consequently a high heat price and other deficiencies of the heating service, regardless of the technical solution in use.

The controversy of centralization versus decentralization is a major factor determining the future of economically viable district heating systems in the region, as well as preserving and promoting the market for CHP. District heating and its non-district alternatives are currently in a fierce competition in the CEE and CIS region. In most cases DH fairly loses the competition because of its low cost-effectiveness in particular locations. The significant overcapacity of DH systems, long distribution networks, large system losses and inefficiency of generation, poor customer focus, and lack of management and control possibilities result in low service quality, unreliability and low affordability. As a result, both poor and affluent customers prefer to disconnect from DH. The current policy issue in these areas is to ensure that the new, non-district heating alternatives, particularly those on individual apartment level, are energy efficient and socially and environmentally friendly.

In other cases, market distortions, discriminatory pricing and other policy and regulatory imperfections threaten the viability of DH systems, which can provide the most convenient and low-cost heat supply under given conditions of population density, number of heating degree days, possibilities for cogeneration, supplementary heat demand from industrial sector, availability of waste heat and local renewable fuels.

To address the above issues, a strategic approach is necessary to address residential gas supply, fuel pricing and cross-subsidies, affordability, heat supply quality, and DSM opportunities. These issues should be handled not only from a sectoral or municipal perspective, but also from the national, regulatory dimension to effectively maintain the competition between heating options to maintain least cost and highest efficiency.

To ensure that efficient heating is available in the urban areas of the CEE and CIS countries, massive investments and capacity building efforts are necessary to either maintain or improve the efficiency of DH, or decentralized heating options should be established along with responsible entities to maintain them. To attract investment in district heating (or other energy services), countries in the region should continue reforming economic and energy sector policies to encourage development of the energy services market.

## **Experiences and Options for Policymakers**

***Creating an enabling legal and regulatory environment*** is the key role for the national government and regulators in restructuring the urban heat sector and attracting investment. Private as well as public funds will be directed to the heat sector if priorities are clearly indicated and if there is long-term sector development plan that clearly defines the directions for developing the sector. Heat sector policy should be based on the current and future needs of the sector, as well as general national social, economic, environmental and strategic considerations. Heat sector policy, driven by the government, needs to be based on serious analysis that includes:

- National level strategic planning of the heat sector within the scope of the general energy sector development, developing action plans and investment programs.
- National policy development decentralizing heating assets and decisions to the local government level, strengthening the role of the heat sector regulator, eliminating barriers for investments and mitigating risks, and providing incentives for energy efficiency, cogeneration and the use of renewable energy in the urban heat sector.
- Provide soft lending instruments using state funds and attracting development credits from IFIs and donors.
- Developing laws and normative acts necessary for the implementation of the above policies and programs.

A large number of laws and regulations governing the heat sector have been adopted in the region, certainly indicating a great commitment to reform. Nevertheless, in many cases the legislation is ambitious but lacks enforcement due to many factors: market failures, uncoordinated actions between various sectors and market players, and a lack of capacity, financing, readiness of the private sector, and public awareness. The new EU members of the CEE region are now significantly driven by EU legislation targeted at energy efficiency, increasing the share of CHP in energy generation, utilizing renewable energy, promoting energy efficiency services and improving building energy performance.

These, when implemented, will yield significant investments in efficiency upgrades, general improvement of economic and environmental performance of the urban heating systems, and reduction of generation costs making, all of which will make heat service more affordable. In CIS countries, urban heat policy is still very much focused on ownership and regulation rather than pursuing least cost solutions, efficiency and investments. After initial regulatory and ownership decisions are made, policy should address metering and commercialization. In most CIS countries, cost minimization, environmental performance and incentives for efficiency upgrades and modernization are still not on the top of the policy agenda.

***Municipal planning of the heat sector*** should be integrated into the local territorial development and municipal energy planning and local sustainable development agenda. Local administrations need to develop municipal heat plans that:

- provide an integrated assessment of the current situation compared to the optimal conditions,
- identify the potential for improvement (in efficiency, economic performance, local environment and social burden, etc),
- analyze and chose the most appropriate modernization or restructuring measures for each zone, estimating their investment needs (short-, medium- and long-term), and
- develop actions for implementing the measures and attracting investments.

These may include decentralizing inefficient DH systems, modernizing municipal heating enterprises, opening the latter to private participation, entering into public private partnerships, and working with ESCOs and housing associations to improve building energy efficiency and demand-side management.

Depending on the authorities of the local administration in a particular country, the municipality may also be responsible for tariff-setting and social assistance. In such cases, the municipality needs to select the best heat tariff mechanism that ensures high collections and cost-recovery, metering, allocation of costs between heat and electricity in cogeneration (if within municipal capacity), etc. while also ensuring targeted social assistance and weatherization programs to low-income households. As the dominant owner of the heating assets and a significant heat consumer, municipalities also have a significant role in entering into partnerships with private entities and investors for modernization, operation and management of urban heating systems.

***Private sector participation (PSP)*** has been one of the key components of legal reform in the heat sector in the last decade. The region's heating assets now have a fair distribution of various ownership types, from full privatization or sale of shares to operational contracts and concessions, resulting in more effective management, transparent accounting and bookkeeping, and improved customer service and quality control practices. The entry of private ownership has eliminated the opposition to DSM that existed when municipal suppliers used space-based billing. While a number of successful restructuring examples happened in municipal DH enterprises without PSP, privately owned or operated heating companies are also more interested in efficiency because they are not subsidized by municipal budgets.

The decade of PSP experiences across CEE countries such as Poland, Czech Republic, Macedonia, Estonia and Lithuania, has many lessons to offer for those still embarking on this road. Nonetheless, introducing PSP requires serious preparation. Any form of PSP, implemented without a clear plan, sufficient competence and political consensus, can result in unsuccessful outcomes for the customers, the business, and the energy sector as a whole. Hence, good legal, technical and business planning groundwork for the PSP programs is essential to guarantee smooth restructuring of the sector and effective use of private investments.

Some of the recommendations derived from the experiences of those CEE countries most advanced in DH PSP are offered below to help guide policy-makers in better crafting the privatization process:

- Initiate PSP only after a clear district heating strategy is in place, outlining the market niches for various heating options and giving investors confidence and indication of national priorities.
- Create transparency and build political and public support for PSP and its expected benefits.
- Enforce anti-corruption measures to avoid sub-optimal decisions by low-paid municipal officials due to “treats” from rich private entities seeking high profits.

- Competence of the municipality in privatization issues is absolutely critical in all aspects of PSP deals, as well as enforcement of the privatization contract.
- Full privatization is not necessary to ensure successful restructuring – even partial privatization or other forms of PSP can provide long-term improvements in system performance.
- The PSP contracts should contain provisions on: envisioning and managing all risks, financing investments and ownership of new or reconstructed assets; operation and maintenance performance specifications; policy specifics on pricing, affordability thresholds, connections and disconnections; the role and rights of the municipality; environmental, sustainability and planning strategies; and an exit strategy and emergency plan in case of under-performance of the operator, with the designated successor to take over after contract termination.
- Municipalities should encourage the creation and strengthening of home-owner associations, as PSPs prefer dealing with housing associations rather than individual flats.

**Energy efficiency services market** development was instrumental in offering energy efficiency solutions to apartment owners, condominiums/home-owner associations, and industrial and commercial heat consumers, in addition to more efficient, affordable and reliable decentralized heating options. The availability of ESCOs accelerated the introduction of metering, regulation and other DSM and efficiency solutions. In many cases, district heat companies are neither willing nor ready to embrace full metering on an apartment level due to the ownership gap in the housing sector: privatized apartment owners are partial owners of the building common space, yet common infrastructure such as heating or water supply pipes do not have a clear ownership in many countries. As a result, the internal networks are poorly maintained and have large losses, which will remain unaccounted for if apartment-level metering is introduced. Instead, block metering of heat consumption on a building level creates incentives for the building owners to eliminate losses in the internal networks. External network losses are also quite large, and the heat distribution companies are solely responsible for them.

The emergence of ESCO-like companies that lease non-operational or economically non-viable heating points and convert them to heat-only boilers and rehabilitate heat supply service to multi-apartment buildings, has served as a major boost to commercialization of the heat supply service. Such businesses are usually very committed to efficiency of generation and minimization of operational losses, but not to demand-side energy efficiency. Moreover, since their revenues form from energy sales, inefficiency of energy end-use will increase their revenues. Nevertheless, such energy service companies have developed extensively as small and medium-size businesses in the heat market across the region and, in contrast to the municipal services, they have devoted serious attention to consumer satisfaction, transparency of billing and collection of fees.

The real ESCO market still needs many efforts to allow the development of ESCO services in energy efficiency project financing and performance contracting. There are many legal barriers inhibiting the development of ESCOs including legal barriers to maintaining funds from energy savings in municipal accounts, and the low attractiveness of energy efficiency projects with long pay-back periods.

**Metering and DSM measures**, motivated by growing heat tariffs, result in reduced demand, which in turn triggers further tariff growth on the supply side to cover fixed costs and unaccounted losses. Moreover, if a large district heating system is only partially metered, the customers without metering devices, billed by consumption norms, bear a heavier burden of the costs associated with the losses. The instabilities emerging from the market acceleration of central heating services largely depend on the scale and density of the heating systems: larger systems adapt relatively easier, while smaller systems with lower network density face major difficulties in balancing the systems, matching investment needs with the limited collection revenues, and generally maintaining a cost-competitive business under pressure from competition and the threat of losing clientele.

Metering combined with consumption-based billing enables consumers to pay according to actual consumption. Initially, billing was norm-based per unit of heated space. However, measurements show that the norms are usually 20% higher than the actual heat consumed per heated space. The norms did not usually take into account the heat releases from humans, appliances and other household activities. Hence, the transition to metered billing was favorable for final consumers, reducing their heat bills by at least 20%. Meters have mainly been installed at the building level, with the meter reading divided between the households (including any losses in common space and on the

way from the substation, which may vary from 10% to 30% of total bill). Naturally, such billing creates some incentives for conservation, reducing DH company revenues. It is noteworthy that after introducing metering, DH companies either have to raise tariffs to recover their fixed costs or they have to introduce a capacity charge. The latter approach allows consumption-based metering and a sustainable economic operation of the DH companies to be combined.

Since building-level metering is only an indirect incentive for energy efficiency for end-users, individual apartment-level metering and thermostatic valves were legislated and became common in most CEE countries. Since most old heating systems use vertical distribution pipes, individual heat meters cannot be installed. This is why heat-cost allocators (HCAs) came into circulation.

According to various studies, the metering and demand regulation programs have saved 12 to 20% energy per heating season. Some of the lessons learned from pilot DSM projects are as follows:

- High quality heat metering and cost allocation devices are a critical factor affecting consumers trust towards heat billing and collection mechanism.
- Installing metering and regulating devices will not be rational until the following six conditions have been met: building-level meters are installed; the benefits of metering and demand regulation tools have been explained to residents; residents understand and specifically request them; the building heating network is well balanced; the additional investment will pay back, and HCAs are not installed without thermostatic radiator valves (TRVs) to allow for demand control.

Considering the current socio-economic condition of the population in most CIS countries, installation of TRVs and HCAs or apartment-level heat meters requires financing. While in CEE countries funding for such programs is made available from state budgets or EU structural funds, in the CIS the lack of financial mechanisms for DSM investments for residential consumers (home-owner associations and condominiums) represents a major impediment to the development of demand-side management and conservation in the heat sector.

**Heat pricing regulation**, on the other hand, is an important tool that may or may not create stimuli for private sector participation, investments in energy efficiency, promotion of CHP and competition for other heat supply alternatives. Heat supply as a utility service must consider local circumstances, such as employment rate, revenues of citizens, and heating degree days. In this regard, pricing should be flexible to incorporate local factors. Throughout the region, heat tariffs are generally set by the national-level regulator, which may have local branches depending on the size of the country. In a number of countries, however, municipalities still maintain the tariff-setting role, which is counter-productive if they are a partial owner of the heating system. Total elimination of regulation for smaller central heating systems is recommended for non-district heating schemes with a capacity of 1 to 5 MW.

In many cases cost-efficiency was achieved even with a one-part tariff, under various price regulation mechanisms such as cost-plus, rate of return, price or revenue caps, or a price adjustment formula. However, when set high enough to cover both fixed and variable costs (e.g. in the Baltics), a two-part tariff with an energy charge covering variable costs and a capacity charge covering fixed costs has significant energy efficiency incentives on the supply and demand sides. This system requires metering and control of end-use.

To guarantee the independence and competence of the heat sector regulator, and find a rational compromise between full centralization and decentralization of regulation, one option is for the national regulator to develop the methodologies and procedures for tariff setting and other issues, while local regulators monitor compliance by the DH companies.

**Strengthening the role of consumers and/or Home-Owner Associations** will allow them to play an important role in the heat sector. Heat sector strategies in some countries (the Baltics, Moldova and Armenia) involve HOAs in the organization and/or operation of heating systems. In Poland, for example, housing cooperatives are the best payers for heat supply. This aspect is relatively clear since there is a service on sale, which is highly demanded by the HOA members, and backed up by a willingness to pay. In other countries of the region the condominiums can also become the service providers, deal with building maintenance and implementation of EE measures. There are numerous successful experiences with heating pilot projects in different cities of Armenia, Latvia and Lithuania which show that condominiums can effectively organize the rehabilitation/construction and operation of their heat supply systems.



Due to legal limitations and lack of property that can be used as collateral, the borrowing capacity of HOAs for any maintenance or EE measures is limited. The solution is usually either state financial support to housing associations, or developing flexible financing schemes coupled with extensive capacity building. Often condominiums seek technical advice from the donor-assisted programs, technical institutes and auditing groups. Gradually, as condominiums gain more experience with such projects, such as in Latvia, the condominiums independently attract loan financing, outsource energy auditing, and implement projects with short to medium, as well as long-term payback periods. The motivation for such measures grows as gas prices rise in the countries of the region and energy-related expenditures become more substantial in the household budgets. Some remaining institutional and technical barriers that need policy and technical assistance intervention include the weak management and institutional capacity of HOAs, legal barriers for borrowing by HOAs and their poor creditworthiness, lack of financing, and the difficulty of reaching consensus among all HOA members for strategic decision-making.

***Financing investments in improving efficiency of urban heating*** deals with three basic problems: lack of equity, lack of customer finance, and lack of access to capital markets. Access to finance depends on the credit-worthiness of the borrower, the financial parameters of the project (closely linked to the cost-recovery of the price level), and any mechanisms for credit enhancement (such as collateral and loan guarantees). Since the multi-lateral development banks can finance only a tiny fraction of the region's needs, it is necessary to attract the local and foreign private capital through commercial lending, vendor credits, PSP, etc. Donor-assisted projects help build lending confidence in this sector and eliminate market failures, such as subsidies and cross-subsidies, lack of metering, access of private sector to heating assets' ownership, to guarantee repayment of these loans. There are also numerous possibilities for co-financing and pooling financial resources from state and municipal funds with bank loans, IFI resources and residents. The intervention of donor-assisted programs and government programs is also important in creating other legal provisions for an enabling environment for investments, including service quality, energy efficiency standards and certification, building energy codes, incentives for energy efficiency, and targeted social assistance.

Based on an in-depth review of heat sector restructuring and reform efforts in twelve countries, as well as an analysis of the experiences with and results generated from reform in the region, several key recommendations can be articulated for national governments and international financial institutions involved in heat sector reform. Some countries began heat sector reform early, mainly due to the availability of technical assistance from international organizations and the political will to embrace reform. Others have only recently embarked on the path to reform and can benefit greatly from the lessons learned in countries more advanced with reform. The main policy instruments that have performed successfully in the region are summarized below, organized by intervention areas, relevant actors, and specific policy and program recommendations that proved effective in countries of the region.

### **Key Problems and Remedies in Urban Heating in Transition Economies**

| <b>Area</b>                     | <b>Problems</b>  | <b>Remedies</b>   |
|---------------------------------|--|---|
| Energy Planning and Competition | <b><i>Failure to integrate the heat sector into the local development agenda and unfair competition between various heating options</i></b> , resulting in suboptimal allocation of heating options from the standpoint of efficiency, the environment, social issues, and safety. | Local energy plans or municipal heat plans to: 1) create a favorable environment for centralized or decentralized heating options, allowing priorities to be carefully assigned based on density of consumption, least cost supply options, local climate conditions, economic welfare, local demand for industrial steam, etc.; and 2) regulate inefficient, unsafe and environmentally hazardous heating options. |

|                                      |  |   |
|--------------------------------------|--|---|
| Pricing and regulation               | <b><i>Underinvestment and tariff subsidies:</i></b> subsidies, cross-subsidies, below cost-recovery tariffs, and other pricing limitations create market distortions that hamper the cost-recovery, viability and competitiveness of the district heating sector.  | An independent regulator allowing for transparent tariffs which cover costs and encourage private sector participation, investments and efficiency, while protecting consumers, allows for economic viability of urban heat supply.   |
| Market Rules and Legal Framework     | <b><i>Lack of focus on the heat sector in the national energy policy agenda</i></b> hampers large investments in this sector, while giving way to other development that is not harmonized with national strategic considerations.   | Develop and adopt heat sector and privatization laws announcing the stance of the state on the heat sector, helping to build investor confidence, a favorable investment climate and general long-term political and economic stability, and stimulating private participation. Provide incentives for CHP and DH enterprises by prioritizing heating options based on economic, strategic, environmental, and fuel availability criteria, as well as energy security considerations of the sovereign governments.  |
| Unsatisfactory Technical Performance | <b><i>Low efficiency of energy use</i></b> is often an issue of technical standards, building codes, performance norms and regulations, which in many countries are outdated and poorly monitored. The affordability of heating tariffs suffers as a result of low fuel efficiency, growing international fuel prices and large network losses.  | Policy provisions for mandatory metering and control of heat energy and incentives mechanisms for energy efficiency to create incentives for demand-side management, combined with financing mechanisms and energy efficiency standards, labeling, certification and codes to achieve the least cost heat supply, preferably combined with utilization of CHP, waste heat and renewables.   |
| Finance and Investment               | <b><i>Lack of financing</i></b> due to low credit-worthiness of municipalities and unattractiveness of municipal heating enterprises for investment (due to poor business management, low level of cost recovery, etc.), as well as the general unfavorable investment climate for private sector participation, energy efficiency upgrades and the introduction of environmentally friendly technologies. Depending on the local financial markets, economic parameters of heat sector investment projects are not always eligible under regular commercial loan terms. | Accelerating the influx of banking capital into the heat sector through the promotion of investment funds and credit guarantees, with support from international loan facilities, and technical assistance targeted at identifying and eliminating market failures hampering investment in the sector.<br><br>Hence, lending in this sector will become less risky and more attractive with financing specifically structured for energy sector investments in general, and heating projects in particular, as well as with institutional strengthening and capacity building for better business management and customer service, in combination with other regulatory reform. |



|   |  |  |
|---|--|--|
| Training, Capacity Building and Awareness, Technical Assistance | <p><b><i>Lack of local expertise and awareness</i></b> among decision-makers of privatization options, innovative financing mechanisms, common pitfalls to avoid, restructuring strategies and programs, and successful replicable models from the region often results in painful mistakes in the heat sector reform process. Additionally, municipalities (particularly the small ones) lack competence and staff in energy planning and management, as well as in managing the restructuring process.</p>           | <p>International technical assistance is needed in designing and implementing policy and regulatory reform, restructuring, financing mechanisms, managing heat supply business, etc. Also, host country governments must be committed to reform, have played a determining role in the direction of heat sector reform and integration of market-based mechanisms into the policy agenda. The international technical assistance should disseminate best practices, build collaboration networks for regional energy security, train municipal energy managers, and cultivate modern business practices in heat company operations.</p>  |
| Social Safety   | <p>Growing fuel prices and elimination of subsidies place a major burden of utility bills on the low-income households. <b><i>Lack of targeted social assistance</i></b>, coupled with a lack of demand-side metering and regulation, can make poor consumers non-payers. This, in turn, affects the cost-recovery of heat suppliers, triggering a long chain of negative consequences – bad O&amp;M, low efficiency, large losses, poor service quality, further tariff growth and larger affordability problems.</p> | <p>Social safety programs providing targeted social assistance to households to mitigate the impact of utility bills help eliminate subsidies, increase tariffs to market levels and make heat supply companies economically viable (as seen in Poland, Hungary and the Czech Republic). They reduce non-payment by low-income households and improve cost-recovery levels, avoiding a vicious circle of low collections, economic mal-performance and poor service quality. Use of social safety net funds is most recommended to finance energy efficiency, which not only reduces heating bills in low-income households and saves energy, but it reduces the volume of heating aid needed in the long run.</p> |
| Environmental Regulations                                       | <p><b><i>Weak environmental regulations</i></b> and the low prioritization of DH/CHP as a strategic environmental objective made the sector vulnerable to competition from emission-intensive heating options and provided no incentives for efficiency improvements, modernization and emission reduction.</p>  | <p>National and international environmental regulations and treaties create requirements and incentives for combating local, regional and global air pollution and mitigating climate change. Environmental policies—such as local emissions standards, energy or carbon taxes, environmental funds, and carbon financing—are often combined with improved efficiency and fuel flexibility, which improves the viability of DH.</p>  |
| Service Quality and Customer Orientation                        | <p><b><i>Lack of Customer Focus</i></b> is a common mistake in the early stages of reform: without proper end-use control and metering, investments made in generation facilities will not be recovered due to poor customer satisfaction and non-payment. These are a result of lack of transparency in billing practices, insufficient communication with consumers, and a lack of focus on service quality, combined with low affordability.</p>  | <p>Introducing end-use metering and control, transparent and consumption-based billing, as well as incentives for end-use energy efficiency (building energy codes and energy auditing), help improve the efficiency of heat end-use and collections. Combined with better customer service, customer satisfaction and collection rates will improve by integrating reliability, efficiency and quality of service indicators (standards) into heat supply requirements.</p> <p>Strengthening the associations of home-owners will enable them to play a bigger role in the organization of transparent billing, DMS measures, fee collections, building energy efficiency, etc.</p>                               |

The above problems are more acute in the CIS and non-EU member countries, in contrast with most new EU member countries where urban heating reform started early. The early reformers achieved remarkable progress improving the economic and technical performance of the heat sector, its cost recovery, and general attractiveness for lending capital. In the rest of the countries, this process is still in its early stage and promoting reform is necessary to facilitate the solution of outstanding problems. The experience of countries which made more progress in heat sector reform offer a rich menu of solutions such as policy tools, technical and financing solutions, private sector participation schemes, and zoning. The CIS and non-EU CEE countries need substantial guidance and technical assistance from experts in their Western neighbor countries in commercializing the heat sector, creating a transparent and effective regulatory framework, making the sector attractive for investments, establishing the appropriate supply-side and end-use efficiency standards and codes, and ensuring the development of the most efficient, least cost and environmentally friendly heating options in each urban settlement to meet the national energy security, energy efficiency, safety and environmental objectives. In this respect, it is instrumental for donor agencies to promote the dissemination of best practices throughout the region, while policymakers will benefit greatly by exploring the lessons learnt and recommendations from the successful reformers in the region. Reforming the urban heating sphere will improve efficiency, mitigate the environmental impact of the region's largest fossil fuel use sector, reduce reliance on imported fuels, alleviate the subsidy burden on municipal and national budgets, and yield numerous other cross-cutting benefits for the sustainable development of the region.

The largest nations, Russia and particularly Ukraine, have started making some progress in heat sector reform. While still far behind their Central European neighbors, they have made ambitious legislative attempts in the sector and Ukraine recently adopted heat and CHP Laws and a National Heat Strategy. Growing fuel prices and the burden on municipal budgets have motivated some visible system modernization efforts. Nevertheless, the modernization and implementation of reform should be further promoted to minimize supply costs, promote efficiency and provide the large populations of these nations with affordable heat.

It is important to stress that there is no single reform model that fits and can be adopted by all. Heat sector reform is a multi-component process and it is critical to steer the path to reform along a sequence of milestones in order to avoid pushing the sector in the wrong direction. A heat sector policy needs to encompass all aspects of the heating chain in its entirety, including private sector participation, financing mechanisms for investment, efficiency on both the supply and demand sides, metering and billing, energy planning at the local level, heat assistance schemes, and effective contractual arrangements for heat supply service.

# Introduction

This assessment of urban heating policy in the Europe & Eurasia (E&E) region is the culmination of work by the Alliance to Save Energy, the U.S. Agency for International Development (USAID) and selected experts to define, analyze and present an integrated, comprehensive assessment of the region's policies, programs and key issues related to district heating – now and in the future. Further, the assessment has drawn conclusions and recommendations to help USAID and other donors understand the myriad of issues involved and the lessons learned to date from attempts to address them, so they may factor these issues and lessons into their donor strategies. In addition to donors, this assessment should also be of value for national and local governments, energy experts and project developers, non-governmental organizations (NGOs) and others who are involved in or otherwise influence development in the E&E region.

The *policies* examined cover the range of legal and governmental measures taken during the last 15 years to address heat sector problems and needs, including energy policy strategies, laws and regulations, and institutional restructuring and reform. The *programs* examined focus largely on donor-funded technical assistance aimed at creating an enabling environment for private investment and making the heating sector commercially viable while ensuring that the needs of consumers are addressed. *Programs* as defined in this assessment include *investment programs*, which sometimes have a technical assistance component and are related to policy strategies.

The assessment focuses on understanding and analyzing how the region's current policy and program frameworks have influenced the use of heat. It explores how district heating has evolved to date and where it is going in the future, in terms of heat price regulation, supplier-consumer relations, competition with other heat sources, affordability, and long-term market viability. It considers the implications for USAID and other donor programs that seek to promote social, democratic and economic development in the E&E region and beyond. It recommends actions that donors, investors, policymakers and other influential stakeholders can take to address the critical need for policy reform, investment and technical improvement in the region's district heating sector.

The assessment includes statistical as well as policy analyses, cites best practices and success stories, and draws upon existing literature as well as research still underway. It describes the heat sector restructuring path and how some “pioneer” reformers managed to reach critical milestones while others still struggle part way through the reform process. For this it draws upon the Energy Efficiency Investment Strategy of the Alliance's Municipal Network for Energy Efficiency (MUNEE) program,<sup>2</sup> as well as case studies about private sector participation in the reform process.

**Table 1. Breakdown of Country Coverage by Regions\***

| Central Europe<br>(EU members) | Eastern Europe/<br>Balkans<br>(non-EU) | Baltic<br>States<br>(EU) | Commonwealth of Independent States |                   |              |
|--------------------------------|--|--------------------------|------------------------------------|-------------------|--------------|
|                                |  |                          | Western CIS                        | South<br>Caucasus | Central Asia |
| Czech Republic                 | Bosnia & Herzegovina                   | Estonia                  | Russia                             | Armenia           | Kazakhstan   |
| Hungary                        | Serbia & Montenegro                    | Latvia                   | Ukraine                            | Georgia           | Uzbekistan   |
| Bulgaria                       | Croatia                                | Lithuania                | Moldova                            | Azerbaijan        | Turkmenistan |
| Poland                         | Macedonia                              |                          | Belarus                            |                   | Tajikistan   |
| Romania                        | Albania                                |                          |                                    |                   | Kyrgyzstan   |

\* - The countries where in-depth assessment was conducted and a country paper on the urban heating sector was produced are shaded in gray.

<sup>2</sup> [www.munee.org](http://www.munee.org)

The scope of this work encompasses the entire Europe & Eurasia region, and countries within the region are grouped according to their respective social transition issues. It includes countries that have a relatively high percentage of operational district heating systems, as well as those with limited and deteriorated systems and evolving decentralized heating. For the purposes of this assessment, the E&E region includes the countries of Southeast Europe, the Newly Independent States (NIS), Baltics and Central Asia. Some countries have undergone a more detailed review than others due to the availability of data and the relevance of district heating in certain countries. The list of countries is presented in **Table 1**. The present report is a regional synthesis driving on individual country reports for those countries shaded in the Table 1, the country reports will appear separately from the present regional paper. Nonetheless, for readers' convenience, the **Annex 1** of this paper contains brief summaries of the current issues in the urban heating sectors of CEE and CIS countries.

To optimize the amount of data analyzed, some of the countries with more unique and replicable experiences were studied more closely (in shaded cells in Table 1), and research was conducted on the ground, while other countries were studied solely on the basis of existing literature and analyses.

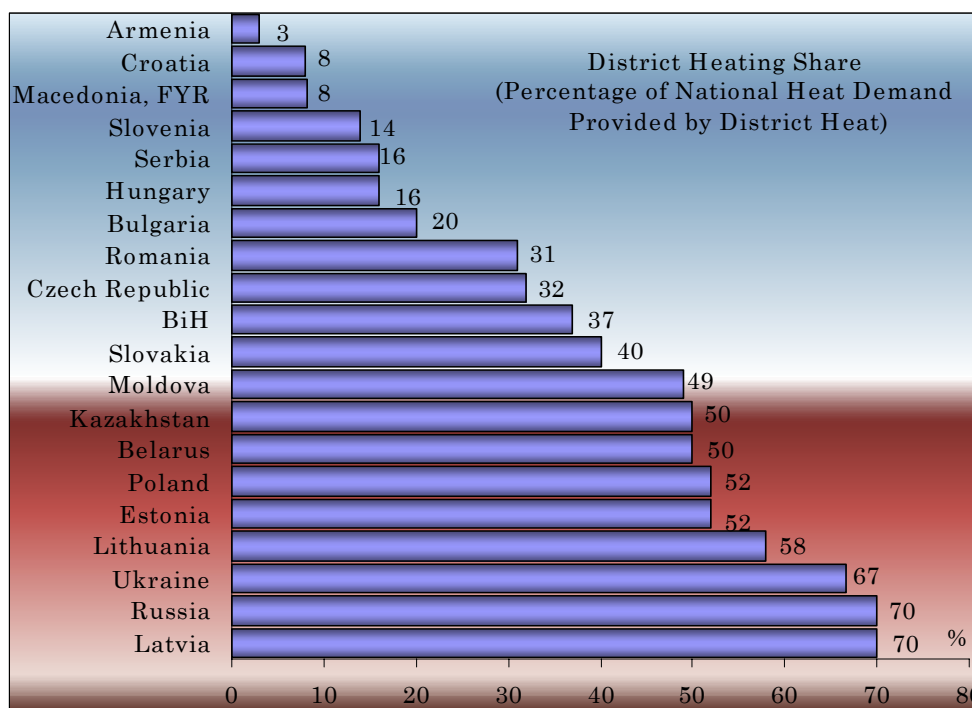
This study aims at re-emphasizing the importance of the urban heating sector of the CEE and CIS countries in the agendas of the national policymakers and international development agencies for a number of reasons presented below:

- Most of the largest single district heating schemes are in this region;
- The heating sector is the region's largest single fossil fuel user, which is also responsible for a large share of the carbon dioxide emissions;
- Every year the district heating sector consumes billions of dollars in emergency repairs due to poor routing operation and maintenance – in Russia about US\$ 3 billion are spent for this purpose annually;
- The heating service has a fundamental social, health and environmental impact and any quality issues, disruptions or price fluctuations have loud public resonance. The problems in the heating sector have secondary effects on unemployment, country-wide inflation, deterioration of other building infrastructures, etc.
- Poor management and administration of the district heating enterprises, and large debts place municipal DH companies and the municipality on the verge of bankruptcy, jeopardizing the sustainability of other municipal services;
- Large thermal losses in the buildings sector makes residential sector the largest heat consumer, where thermal modernization can save up to 30% of heat energy otherwise wasted;
- The uncoordinated policy efforts result in growth of decentralized heating, losing the efficiency and environmental benefits, increasing national energy intensity, dependence on fossil fuel supplies;
- The Russian district heating sector – the largest in the world – accounts for about 45% of all domestic energy consumption, and for about 50% of fossil fuel use, is the largest single product market in Russia split into more than 50,000 local markets with US\$ 36 billion annual sales, accounting for about 6% of GDP,
- The wide spectrum of remedies for most of the technical and institutional problems of urban heating sector are available in other countries more advanced in reforming the sector;
- IEA has estimated that effective policies promoting energy efficiency in the district heat generation alone can annually save up to 80 billion cubic meters of gas, a potential for 350 million tons of preventable carbon dioxide emissions per year.
- While most energy efficiency projects in heat sector can pay back in roughly five years, the national energy policies have failed to create an adequate investment environment that would contribute to the promotion of energy efficiency measures, commercialization of heating services, and the promotion of the most environmentally friendly heating option.

## Trends in Urban Heating and the Nature of Current Problems

The urban heating sector of Europe and Eurasia is highly supplied by district heating (**Figure 1**).<sup>3</sup> The transition economies inherited old and oversized district heating systems which serving roughly 250 million people in Eastern Europe and the Former Soviet Union. In the coldest inhabited region on earth, the adequacy and efficiency of district heating remains a matter of survival and a top economic priority. According to World Bank estimates, heating costs consume 3% to 15% of individual household incomes, and in Russia they consume more than one-tenth of the national budget.

**Figure 1. Share of DH in Providing National Heat Demand in Selected CEE and CIS Countries**



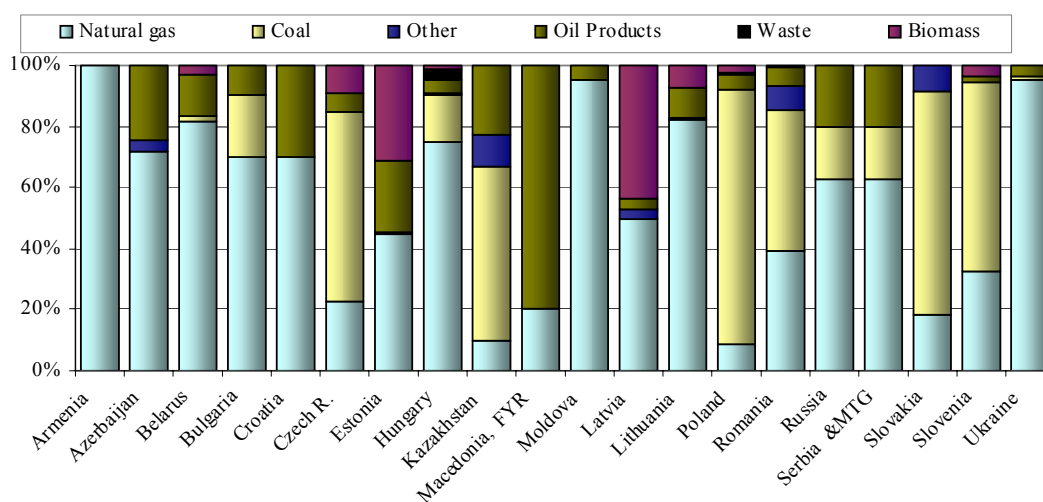
*Source: Data collected by authors and EuroHeat 2005 Survey*

Heating fuels were re-examined in the heat sector development agenda in the face of rising prices, strengthening environmental regulations, and the need for increased reliance on domestic fuels and energy security. The instability of fuel supply and frequent price fluctuations seriously threaten the viability of DH enterprises, under the current availability of alternatives heating options. At the same time, stricter environmental regulations complicate the use of cheaper, locally available coal, especially with the growing popularity of carbon taxes largely applied in EU countries, which monetizes the pollution costs of dirty coal combustion. The availability of competing heating fuels, particularly the natural gas network running parallel to the DH networks, has fed a rapid rise in the use of direct-gas heating via individual apartment boilers or space heaters. High rates of disconnection have resulted (e.g., over 20% in Romania), posing a critical threat to the viability of the

<sup>3</sup> District heating incorporates the centralized supply of residential space heating, most often delivering warmth in the form of water heated in boilers and pumped through pipes to customers across a municipal area.

centralized heat supply market. As **Figure 2** indicates, with the exception of countries with their own coal reserves, most countries in the region heavily rely on imported natural gas.

**Figure 2. Structure of Fuels Used in DH Sectors of CEE & CIS Countries**



*Source: data collected by authors*

The technology of district heating is generally a good fit for the transition economies, where most people live in densely situated multi-family housing. Many apartments, as well as institutional and commercial buildings, receive heat from a central heating station. Moreover, district heating allows for possibility to utilize waste heat, cogeneration and fuel flexibility, which is a growing issue in some countries of the region when due to price or reliability of supply the key DH fuel becomes undesirable (e.g. Ukraine considering substitution of natural gas for DH with indigenous coal in Ukraine, or the efforts to switch to biomass in EU countries to mitigate carbon tax load). Large boilers in these central plants should be able to generate economies of scale, but due to under-investment in equipment and renovation in the boiler houses, pipelines, and buildings, up to one-half of the energy is wasted. Old Soviet-style housing requires two to three times as much energy to heat a given amount of floor space as American single-family homes.

The above issues exist in all countries of the region, each of them affected by a combination of different problems. Consequently, heating systems currently operating can generally be characterized by a list of deficiencies that include but are not limited to the following:

- low efficiency and overcapacity of depreciated generation facilities,
- undeveloped automation and control systems
- excessive estimates of consumption heat loads;
- uneconomical centralization of DH systems and often low share of CHP production;
- large transmission and distribution losses in networks and excessive use of make-up water,
- insufficient insulation,
- large infiltration losses in the buildings;
- lack of metering and consumption-based billing;
- inability of consumers to control consumption, costs and comfort levels;
- low comfort level and therefore low collection rates;
- competition from individual heating options;
- lack of incentives to improve efficiency and shortage of qualified personnel;
- lack of effective cost allocation procedures;
- heavy burden of subsidies on municipal budgets;
- competition from decentralized or individual heating options; and

- high investment risk in the heating sector;
- high specific consumption and high emission intensity;
- unreliable supply, overheating & under-heating;
- tariffs that fail to recover costs, further exacerbating the lack of maintenance; and
- lack of financing.

Gochenour<sup>4</sup> has described similar technical problems in 2001. In some of the countries reviewed, particularly in the CIS region, little has been accomplished in past six years in eliminating these problems on the ground. The earliest efforts in the past years have focused on reforming the legislation, introducing market principles, creating independent regulation, gradually eliminating subsidies, while not much has yet been accomplished in the next phase of reform: establishing service quality requirements, favorable investment climate, incentives for energy efficiency improvements, attracting private sector participation, etc. Hence, most of the aforementioned technical problems still remain acute in the region.

CEE governments have reformed legislation, transferring the ownership and management of DH assets and opening the heating sector for private participation and investment, meanwhile CIS governments are still holding onto municipal heating assets. These assets are a huge financial burden, an ineffective social tool and constant political headache as fossil fuel prices escalate.

In Poland, for example, heat supply constitutes one of the most important sectors in the energy economy, with approximately 50% of primary energy utilized for heat generation. At the same time, space heating and domestic warm water consume approximately 80% of energy used in the housing sector. Since 1990, subsidies were gradually eliminated and the district heat sector was opened for private ownership, catalyzing restructuring and investment that resulted in better economic and environmental performance, service quality and cost minimization. Meanwhile, in Russia the heat sector represents the largest single product market split into more than 50,000 local markets with \$36 billion in annual sales. However, the neglect of the sector is evident from the fact that the heat sector urgently needs roughly \$50 billion in efficiency improvement investments, which could yield \$10 billion in annual savings. Yet only one percent of the required investments is actually made annually, resulting in outrageously high operation costs, low efficiency and high losses. And every year, federal, regional, and municipal authorities struggle to provide adequate and reliable supplies of heat during the cold season, with about \$3 billion spent annually for this purpose, along with another \$3 billion annually to address numerous emergencies.

The IEA *Coming in from the Cold* study groups countries by their climatic conditions, share of district heating and their EU accession status, breaking them into the following groups: (1) New EU member states and applicant countries; (2) Belarus, Kazakhstan, Russia and Ukraine; and (3) Southeast Europe, Caucasus and Central Asia.<sup>5</sup>

Climate conditions and the potential social, health and safety impacts of long-term failures in the supply of central heat keep public pressure on the government to keep energy at the top of the political agenda.<sup>6</sup> Some of the general geopolitical and macro-economic factors affecting the viability of district energy services include political stability and macro-economic performance of the country. Armed conflicts, disturbance of regional trade routes, and the absence of political stability have occasionally resulted in damaged heating assets, disrupted fuel supply and distracting from a political focus on the heat sector and the energy sector in general. Political stability within a country allows

<sup>4</sup> Gochenour, C. *District Energy Trends, Issues, and Opportunities: The Role of the World Bank*. Technical Paper No. 492. Washington, D.C. 2001.

<sup>5</sup> M.Evans and E.Douraeva. *Coming in from the Cold. Improving District Heating Policy in Transition Economies*. IEA/OECD. Paris 2004.

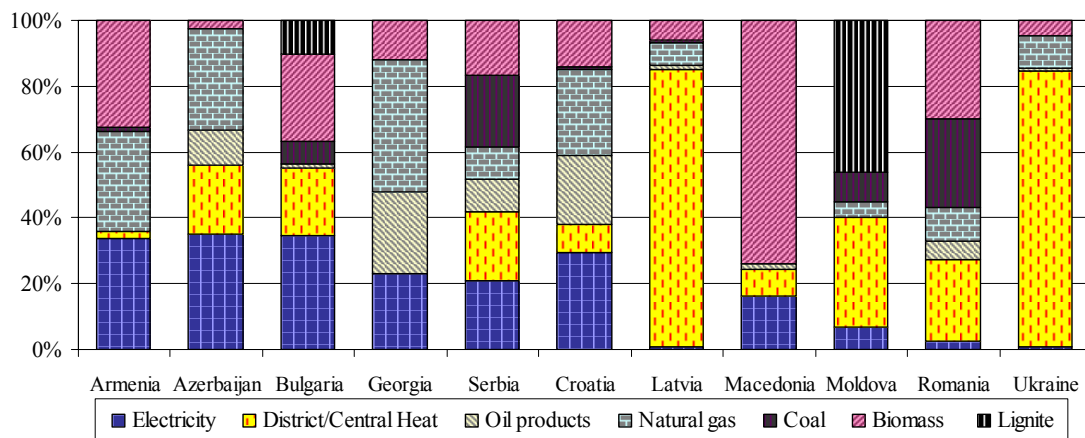
<sup>6</sup> In both of the latest publications on this field – Gochenour (2001) and Evans and Douraeva (2004) – agree that the local climate conditions play a determining role for the viability of DH. Colder climate combined with large hot water demand helps maintain the DH systems.

the Governments to focus on the utility sector and act proactively to solve the issues of the sector. The economic crises and shortage of national funds accompanying the initial transition from planned to market economy, on the other hand, have resulted in overall economic shock, which also left the economically, socially and environmentally important heat sector without financial resources and vital subsidies, before the sector reformed. The general economic performance of the country and availability of national funds necessary to provide incentives and invest in and support DH operations in periods of transition are instrumental to avoid their collapse.

The last 10 to 15 years have been a major test for the heating sector in the region. Rising fuel prices coupled with dramatic domestic currency inflation and drastic reduction in industrial production levels resulted in a drop in industrial heat demand. In the CEE countries the prices grew so much, that the market-based economy and social pressures created the motivation for consumption-based billing and demand-side energy efficiency across all consumer groups, causing a drastic reduction in central heat demand.

**Figure 3** presents the energy consumption for heating purposes in selected CEE and CIS countries. It shows that electricity, biomass and natural gas are the leading fuels of choice in these countries, with natural gas heating a growing threat to DH in the cases of Bulgaria, Romania, Serbia, Croatia and Moldova. Overall, the breakdown of fuels shown in this figure testifies to the prominence of environmentally damaging heating choices—coal, oil and open burning of biomass—that are associated with excessive greenhouse gas emissions, local and indoor air quality hazards, and deforestation.

**Figure 3. Structure of Fuel Use for Final Heat Energy Consumption**



Source: data collected by authors

The review of MUNEE country studies and reports produced by other international and donor-assisted programs allowed key similarities and differences between the countries to be revealed. The current technical and economic state of urban heating systems in the countries of the region are at varying stages of development or decay, and new decentralized alternatives have been adopted to different degrees. The different economic, financial, ownership, social and technical aspects, as well as local climate and population density, result in different degrees of efficiency, reliability, cost-recovery, affordability, and environmental safety. In this regard, countries sharing similar problems can be divided in four groups:

1. **CEE & Baltic States (new EU members):** District heating (DH) has a long history and large share in urban heat supply. DH consumption has gone down significantly due to reduced residential and industrial heat demand. DH assets have been privatized for the most part, and private sector participation has brought large investments in efficiency upgrades, better reliability and environmentally friendly technologies. Also, DH systems are slowly expanding to connect more customers, even though they may soon appear under the competitive pressure of individual gas heating as the gas distribution network develops. In most countries in this region, DH and gas prices are still regulated. The DH/CHP electricity produced is purchased at a regulated low



price, hurting cost recovery at DH/CHP enterprises. Heat prices in the majority of countries allow full cost-recovery, while social systems support the low-income households. The priority issue in the new EU-17 countries is to make their DH sectors more environmentally friendly, for example by improving combustion efficiency, utilizing waste heat and flue gases, switching to cleaner fuels, combining heat and electricity production, and setting and reaching benchmarks on mandatory renewable energy use in heat production. In many cases, the EU accession funds have played an important role in financing metering and building thermal modernization. The Republic of Macedonia, where the DH company is privatized and profitable, also falls in this group, as well as Croatia where the DH systems are expanding, privatization and investment plans are underway. The CEE and Baltic countries have the highest share of private sector participation in ownership of heating assets.

2. **Balkan countries (non-EU members):** With the exception of Macedonia, the war in former Yugoslavia has set back the newly formed countries with regard to heat sector restructuring. Heating assets were seriously damaged, debts for heating fuels were inherited by the new entities, and municipalities are incapable to investing in heating assets, all contributing to low system efficiency and large losses. With growing imported gas prices, shy steps towards raising tariffs were taken, but did not fully eliminate municipal subsidies or make DH companies fully cost-recovering.
3. **Russia, Ukraine, Belarus, and Central Asian Republics:** DH is the dominant urban heat supply option. There is substantial excess installed capacity in aging facilities; inability to accurately estimate consumer heat loads (largely due to building heat losses, unsanctioned modifications of systems within homes, etc.); excessive centralization of DH systems (DHSs), low density of heat loads and corresponding high level of distribution losses; lack of regulation over heat supply quality parameters. The payment collection remains low due to the absence of effective cost allocation procedures. Investments are hampered due to misleading indicators for investment decisions to rehabilitate different parts of DH systems: clear dominance of reliability criteria in assessing DHS managers' performance; lack of incentives to improve efficiency and shortage of qualified personnel, especially in small-size heat supply systems located in small towns. The perception of DH as a social good inhibits the political will for reform and commercialization in the heat sector, still largely remaining under state or municipal ownership, slowly rising tariffs to cost-recovery levels.
4. **Albania, Georgia, Armenia, and most of Moldova and Azerbaijan:** Due to a lack of financing, heavy subsidy burdens on municipal budgets, insufficient O&M, poor management and a number of other reasons, DH systems in these countries are either on the verge of collapse or have collapsed completely. Decentralization, or the transition to individual apartment heating schemes, has developed haphazardly due to the degradation of DH systems. National policy and regulation is a few steps behind developments in the heat sector, and there is no local experience managing the services, enterprises and prices of this evolving sector.

While there is no strong correlation between the ownership structures and the economic viability of urban heating sectors in the above countries, however the CEE countries have the largest share of private sector participation in the heating assets' ownership and management, and have observed the highest rate of investment in the DH enterprises.

The general trend, with minor exceptions, can be vividly observed. The key problems affecting the viability and continued development of district heating in the transition economies of the CEE & CIS, in addition to their technical deficiencies listed above, are as follows:

***Discriminatory pricing mechanisms:*** subsidies, cross-subsidies, below cost-recovery tariffs, and other pricing limitations create market distortions that hamper the cost-recovery, viability and competitiveness of the district heating sector.

**Lack of Energy Planning:** Failure to integrate the heat sector into the energy policy agenda, for example by including urban heating into local energy planning and mandating connection to DH systems, where available and cost-effective.

**Lack of Finance and Investment:** Lack of financing including investment funds and incentives that improve the general business and investment climate for private sector participation (PSP), energy efficiency upgrades and the introduction of environmentally friendly technologies.

**Lack of local expertise and awareness:** Insufficient knowledge of privatization options, innovative financing mechanisms, lack of understanding of the unique features of the heat market compared to electricity and gas, common pitfalls to avoid in particular restructuring strategies and programs and successful replicable models from the region often results in painful mistakes in the heat sector reform process.

**Imperfect Social Safety Mechanisms:** Growing fuel prices and elimination of subsidies place a major burden of utility bills on the low-income households. Lack of targeted social assistance, coupled with no demand-side metering and regulation, can make poor consumers non-payers. This, in turn, affects the cost-recovery of heat suppliers, triggering a long chain of negative consequences – bad O&M, low efficiency, large losses, poor service quality, further tariff growth and larger affordability problems.

**Weak Environmental Regulations:** Lack of strict environmental regulations and low prioritization of DH/CHP as a strategic environmental objective made the sector vulnerable to competition and lacking incentives for efficiency improvements, modernization and emission reduction.

**Supply-side bias:** Supply-side policy bias with insufficient consumer orientation is a common mistake in early stages of reform: without proper end-use control and metering the investments made in the generation facilities will not pay back due to poor customer satisfaction and non-payment.

**Competition with other heating options:** The speed with which gas supply networks are being developed to reach individual households is creating competition from decentralized, individual heating options (not always efficient) with less flexible and controllable DH.

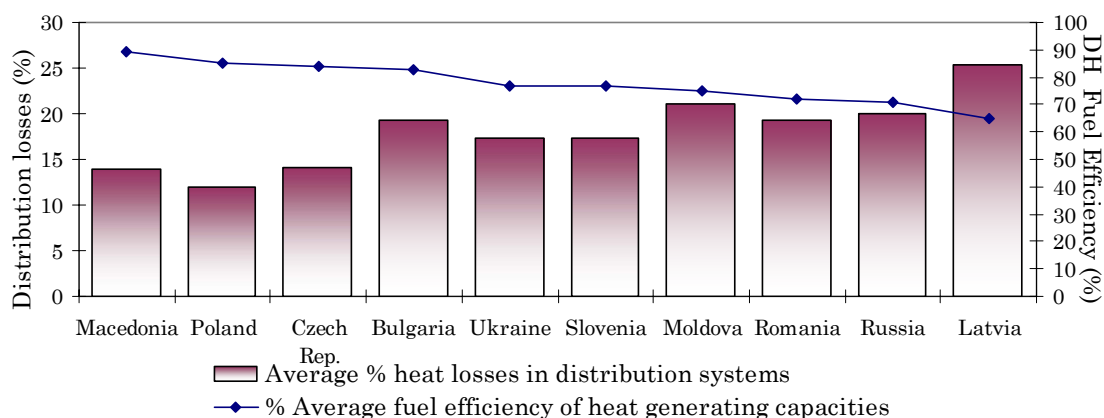
Due to the reasons including but not limited to those listed above, the current technical and economic state of DH systems in the countries of the region are at varying stages of development or decay, and new decentralized alternatives have been adopted to different degrees. The striking thing about most of these countries and their policies is how incomplete and haphazard they are. While strategy and policy at the highest level have been articulated and even given institutional life in many of the nations, these changes beg the most important questions. The questions have not been answered in much specificity as to who is accountable for performance; who is to provide leadership to ensure resources are available to meet the high costs of metering, system reconstruction, and buildings renovation; and who ensures that conflicting signals and incentives—cross-subsidies, split incentives, and inattention to crucial detail—are worked out. The magnitude of this policy failure would be serious even if it involved only economic and environmental costs, but in fact the failure imperils the health and safety and energy security of whole populations, making it hidden threat to the security of nations of the region.

## Losses and Inefficiency

Since the average fuel efficiency of district heating in the region ranges from 55% to 90%, and transportation and distribution losses range from 15% to 70%, it is critical that the energy performance of end users—such as internal heating networks, buildings' thermal insulation, and thermal regulation and control—be as high as possible. (See [Figure 4](#) for data on selected countries.) It is also important to note that uncoordinated, spontaneous introduction of heat metering and cost allocation can only create technical and economic instability: the producer would not be able to pass on the losses to the customers who have meters or heat cost allocators (HCAs), and those consumers who do not still pay per heated space would have to bear all costs for losses, as the tariff will have to

go up. Real economic effects—improved efficiency, reduced losses, lower fuel consumption, decreased pollution and lower heat supply costs—can only be achieved through well coordinated actions by all entities involved in the heat supply and end use process. This also includes legal requirements or incentives for improved building energy performance and commercialization of utility services to encourage efficient resource use. In Russia, for example, 75% of all heat losses occurs in the residential and public buildings. Heating buildings accounts for nearly half of all heat end use, more than that of the industrial sector, the second largest heat consumer.

**Figure 4. Key indicators of DH system performance in selected countries: average efficiency and distribution losses**



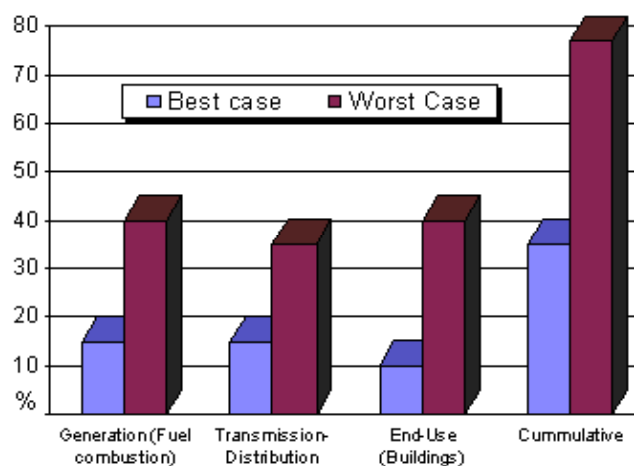
Source: data collected by authors and EH&P 2005 survey for the Czech Republic and Slovenia

Using the best available technology, energy and cost savings of 30% can readily be obtained in most district heating systems throughout the region by implementing basic energy efficiency measures. Opportunities abound for improving energy efficiency in generation, transmission, and distribution of heating for buildings. Introducing more cogeneration will produce higher efficiencies, while DH/CHP will allow for utilizing waste heat and switching between fuels, particularly important for fuel importing countries. Access to the technical fix will depend on the availability of financing, which in turn depends largely on policy reforms and continued economic development in the region.

Energy losses occur throughout the entire system, as shown by the World Energy Council data in **Figure 5** as well as numerous other studies of the region. All three components (generation, transmission-distribution, and end-use) provide opportunities for improving the energy efficiency of heat delivery.

Improvements in generation consist of using more efficient combustion and heat-generation systems, fuel switching, and improved maintenance and operations. Improvements in the transmission and distribution system consist of more modern and efficient substations at the interface between transmission and distribution, and insulating pipes. Energy efficiency improvements at the end use level consist of modernizing equipment and controls to interface individual buildings with the distribution system; user controls on individual radiators, insulation in walls, ceilings and floors;

**Figure 5. Heat System Losses in CEE and CIS Countries**



Source: WEC 2003

energy efficient windows; and weather stripping on windows and doors. The purpose of the present analysis is to conduct a thorough review of the actual impacts resulting from heat sector policy reform and efficiency improvements in heating systems.

## Cost Recovery and Affordability of Heat Tariffs

Cost recovery and heat tariffs have changed substantially during the past 16 years – in most countries of the region subsidies were partially or fully eliminated, replacing them with direct heat assistance to

### Box 1. Current Status of Heat Subsidies in CEE and CIS Countries

Poland, Latvia, Hungary and Bulgaria have gradually eliminated heat subsidies. These replaced by targeted subsidies depending on the household income and paid directly to the heat supply companies or households. **Figure 6** illustrates gradual phase-out of DH subsidies in Poland. Nevertheless, Poland still has cross-subsidies between power and gas sectors, the latter contributing to low competitiveness of DH with direct gas heating.

In Czech Republic has maintained a form of DH subsidy: VAT for heat is 5% lower than for gas and electricity (19%).

Romania is in gradual transition process from national subsidies (national reference price fixed below cost recovery levels) to prices reflecting the real costs of heat generation and supply at each locality (local reference price). Nevertheless, the municipality may still establish the local reference price below cost-recovery level, or provide fuel subsidies to the DH company. Transition is being made to targeted subsidy mechanism, which is already in place but will have to be further developed.

In Russia, direct heat subsidies were eliminated. There are still fuel subsidies paid by municipalities to the DH enterprises.

Recently, the majority of Ukrainian regions (80-90%) phased out general subsidies for district heating. In these regions heat tariffs cover practically 100% of heat production costs. In cases, where the local administration provides subsidies, heat tariffs amount to up to about 80% of the production cost. Instead, utility social assistance is available for vulnerable population groups, which either have over 20% of household budget spent on utility bills, or are in general state social support group. There are still “privileged” heat consumers (usually civil servants) whose bills are subsidized by the government. Despite many promises, Ukraine still has below cost-recovery gas prices for residential consumers.

In all of Bosnia and Herzegovina, with the exception of Sarajevo, all municipal DH systems have such high energy losses (often exceeding 60%), which are covered by the government. In Croatia cross subsidy remains between heat and electricity within the state company HEP, which owns both heat and electric generation facilities. Serbia still has general subsidies and cross subsidies. For example, the City of Belgrade used to co finance fuel purchases for the DH Company. Cross subsidies are mostly paid by commercial consumers who have to pay much higher tariffs than residential consumers.

Moldova still has state subsidies in place for natural gas which affect also district heating. Municipalities are allowed to subsidize heat tariff, and recently such a decision was made by Chisinau municipality, which subsidized over half of the heating costs due to large losses, which cannot be recovered by the heat supplier Termocom.

low-income households, although some of the CIS countries, including the largest DH nations Russia and Ukraine, still partially maintain subsidies.

In a few countries, the transition was made to two-tier tariffs. The opening of the heating industry to private capital and ownership has introduced a business perspective into the heat supply service, more

aggressively pursuing collections, cost-recovery and efficiency. The level of progress in this matter varies widely across the region.

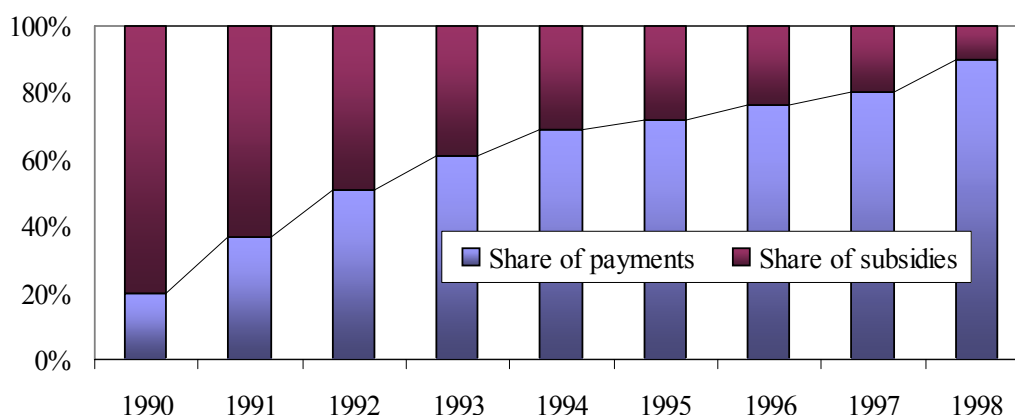
In principle, all countries have accepted that tariffs have to cover full costs. But in practice, regulatory procedures and heat service operations are more complicated and have certain indirect barriers to full cost recovery. The major barriers are as follows:

- (i) Regulators do not always accept and/or approve all costs. In all cases, tariff calculation methodologies have a pre-approved list of components, which do not include all necessary components, such as investments, repayment of borrowed capital, etc; and tariff approvals usually follow a long, bureaucratic process, and tariff components are sometimes approved with a significant delay, leaving the heat supplier with under-recovered costs for the heating season;
- (ii) Regardless of the tariff structure, for full cost recovery heat suppliers need full collection of heating bills. The collection rates have improved significantly in some countries going from 0-20% to 70-90%, substantially improving the cost-recovery level.

Unfortunately, no statistics are available about the real cost coverage of DH enterprises in the region, as this would require enterprise-level data. Similarly, the data on enterprise-level collection rates is also not available in the national statistics.

Competition plays a limited role in determining district heating prices across the region. Competition strongly influences prices in Finland, where district energy tariffs average around \$11.70 per gigajoule (GJ). The weighted average across the formerly planned economies is only about \$7.50, but this includes the heavily subsidized prices in Russia and Ukraine, which account for almost half of all district energy consumption in the region (see [Figure 7](#)). The Czech Republic, Estonia, Hungary, Lithuania, and Poland, as well as several large Western European nations, still practice cost-plus pricing. The Czech Republic and other nations, however, have recently adopted a more flexible approach to pricing which sets caps on tariffs and allows flexibility in pricing as a way of creating incentives and possibly competition. In general, national regulatory authorities set these tariffs.

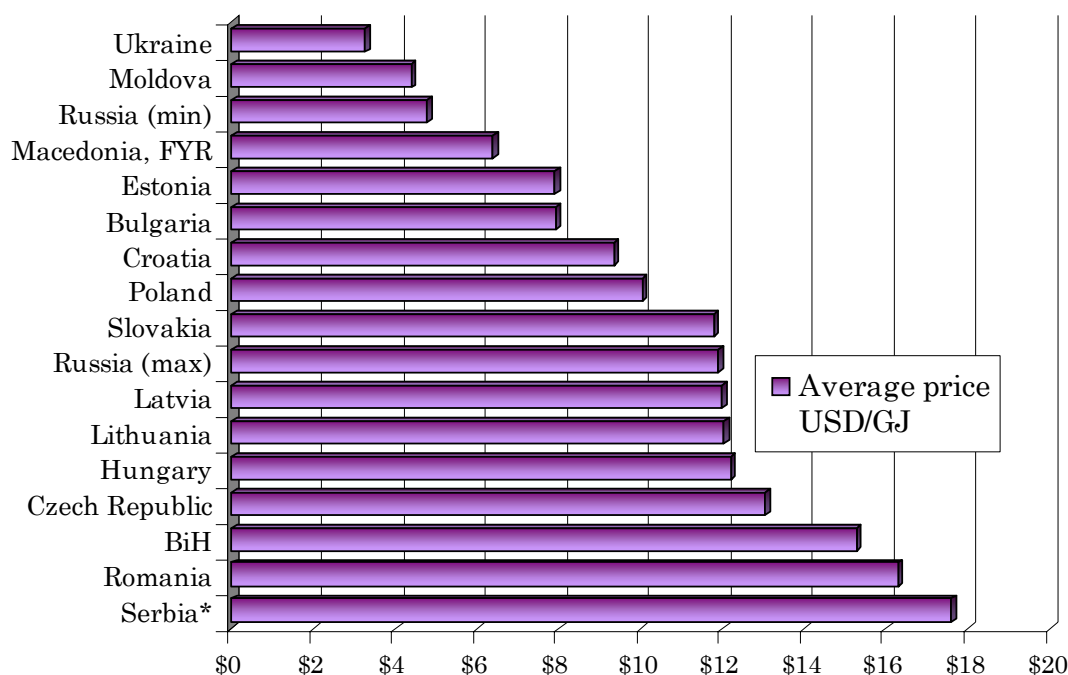
**Figure 6. Gradual Phase-out of Heat Subsidies in Poland from 1990 to 1998**



*Source: Polish Energy Regulatory Agency*

energy consumption, but due improvements on the supply side such as replacing coal with gas, washing coal, and improving combustion efficiency.

**Figure 7. District Heat Prices, 2004-2005**



*Sources: Data collected by authors and EuroHeat.*

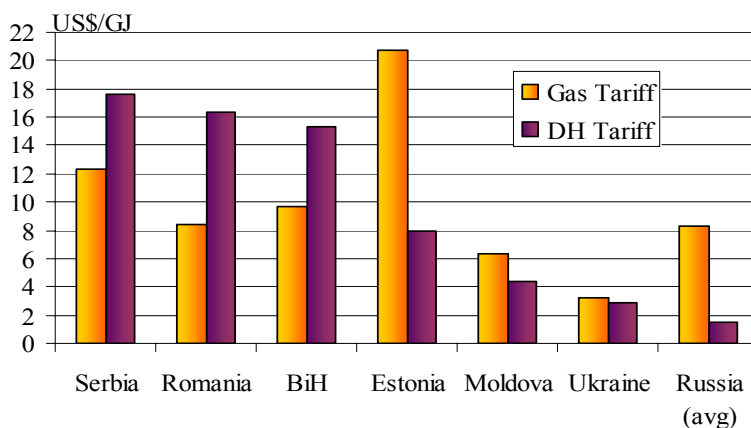
\*In Serbia, only large consumers pay for metered energy, the households pay for heated space, and there is no tariff effective for thermal energy.

Under the prices given in **Figure 7**, price competitiveness of DH can be measured against its two key competitors – gas and electricity. DH prices ranging from \$3.3/GJ to \$16.7/GJ is competitive with electricity under retail electricity tariffs of \$11.8 - 63.4/MWh, which is equal or lower than the electric prices in most countries of the region. The situation is quite different for natural gas. The wholesale price for natural gas in the region is about \$75/TCM to \$170/TCM without taxes in countries with cheapest gas Russian supply and is from \$200/TCM to \$413/TCM in most of Baltics and CEE. With the addition of taxes and operational costs, the retail tariff for residential natural gas is much higher. For example, in Estonia the residential consumers pay \$693 per cubic meter of natural gas<sup>7</sup>, which makes DH competitive as it supplies heat energy at \$7.9/GJ which is well below the cost of direct gas supply, which under retail residential gas tariff would cost \$20/GJ. This explains the strong position of district heating in Estonia. Similarly; in Moldova the 2006 residential gas tariff allows individual gas heating at 6.36 USD/GJ, while average DH price is \$4.4/GJ in areas where DH is available, which explains why DH survived in those locations. Whereas, in Bosnia the DH energy costs \$15.3/GJ compared to the direct gas heating costing \$9.7 USD/GJ under the current tariff<sup>8</sup> thus making DH non-competitive. The comparison of residential natural gas and DH tariffs for selected countries is presented in **Figure 8** to illustrate the critical impact of pricing on the viability of various heating options, particularly DH.

<sup>7</sup> The residential gas tariff is differentiated by consumption volumes \$693/m<sup>3</sup> for consumption <200m<sup>3</sup>, \$454 for < 750m<sup>3</sup>, and \$374 for > 750m<sup>3</sup>.

<sup>8</sup> The gas tariff in BiH ranges from \$223.9/tcm to \$393.6/tcm.

Figure 8. Comparison of DH and Natural Gas Tariffs (US\$/GJ) for Selected Countries (2006)



Source: Data collected by authors

Pricing is a trickier criterion because price is a matter of balance. One does not want it as high as to impose a social burden on the population (as social safety funds are usually insufficient to cover all in need), but neither does one want subsidized prices. Only a few countries—Bulgaria, Estonia, Hungary, and Poland—appear to have achieved a reasonable balance. Russia, Ukraine, Kazakhstan, and Belarus clearly have priced heat too low because in each case the price of the heat is less than the price of the fuel used to make it. This situation is the

definition of “unsustainable” development. While Latvia, Lithuania and Slovakia have raised prices to levels that encourage investment and conservation, their prices are also high enough to raise equity concerns. These countries have the highest levels of household income required for heating, and require attention to investment for efficiency to reduce that burden to customers.

Our assessment regarding these factors stems from specific, quantifiable evaluation of prices, costs, and performance. Each of these, in turn, stems from systems issues of ownership, accountability, and incentives. Pricing should be economic to achieve restoration of the heating systems and the social implications should be addressed by the social safety nets, which are the targeted welfare payment subsidies and residential energy efficiency. Only as a last resort and temporary measure, some tariff adjustment that minimizes economic distortions can be considered.

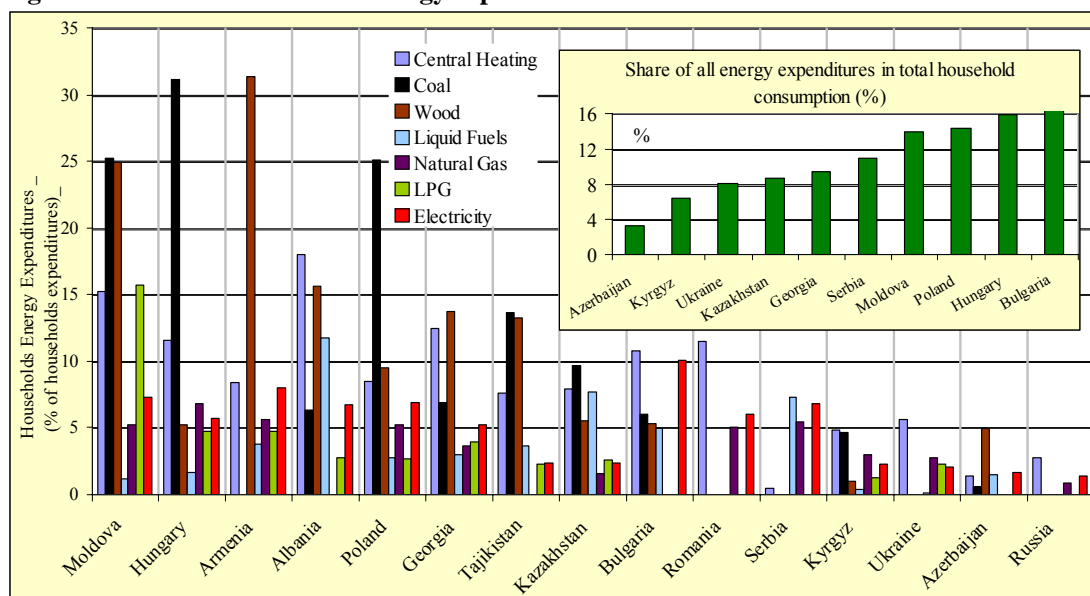
Because of increasing fuel prices in recent years, the real cost of heat (as opposed to the price consumers actually experience) has risen at least as fast as economic growth if not faster. As the economies in most of the non-accession countries in the region have not yet regained their pre-transition GDP levels,<sup>9</sup> the ability of people to afford heat has generally been declining.

<sup>9</sup> Based on the most recent (2006) EBRD Transition Report, GDP levels are still below 1989 levels in Bosnia & Herzegovina; Macedonia; Montenegro; Serbia; Russia; Azerbaijan; Georgia; Moldova; Ukraine; Kyrgyzstan; and Tajikistan.



The affordability of heating services is analyzed based on the World Bank household survey findings. While the usual consensus figure for the limit of affordability of heat is 10% of household income, **Figure 9** shows that the average household income spent on central heating in Moldova is over 15%, compared to 3% to 5% in Russia and Kyrgyz Republic. According to WB data, the average

**Figure 9. Share of Household Energy expenses in E&E countries**



Source: World Bank

household expenditures on central heating range from 1% to 18%, and roughly 2-3% more in each country's lowest income households. However, as the present analysis will further illustrate, DH prices often do not reflect the true costs of supply, but are more a result of social policy decisions. Moreover, the DH prices often do not even reflect the total price that households pay for heating, since supplementary electric heating is common in some countries, due to the unsatisfactory quality of DH service. The basic rules of supply and demand create a situation where low income, and therefore a low ability to pay, results in a cheaper but lower quality product. So some countries, on average, can pay only for low level of comfort, while others can afford a high level of comfort, but certainly the production of low quality service is not the result of a policy or marketing decision: poor performance of heat supply enterprises evolves from the low economic status of the population, tariff limitations, and low collection rates. **Figure 9** also illustrates the significant share of other energy expenses, which supplement or substitute central heating, in the consumption of households of the region. 1.3% to 10% of household expenditures are spent on electricity; 1-7% on natural gas; 1.3-16% on liquid petroleum gas; 1-12% on other liquid fuels; and 1-31% on wood or coal. The latter have a substantial share in the household budgets in countries with little or no district heat supply. In Albania and Moldova the energy expenses for one type of fuel often range from 15% to 30%, which is significantly over the commonly accepted affordability limit. As a result, many households chose to heat only one room, sacrificing comfort to remain within the affordability limits.

Centralized tariff-setting decisions—that is, by national regulators rather than municipalities—and the elimination of subsidies without a well-designed social safety net to compensate, has in many cases had tangible deleterious impacts on low-income households. Substituting heat subsidies with targeted assistance for low-income families has generally been the best practice in countries in the advanced stages of heat sector reform. Middle-income groups, however, will be stressed by the elimination of subsidies unless widespread and thorough efficiency improvements are made to reduce heating costs. Without supplying heat at the lowest possible cost, heat supply will perpetually remain sub-optimal. To compensate for high costs, apartments will be under-heated, the heating season will be shortened,

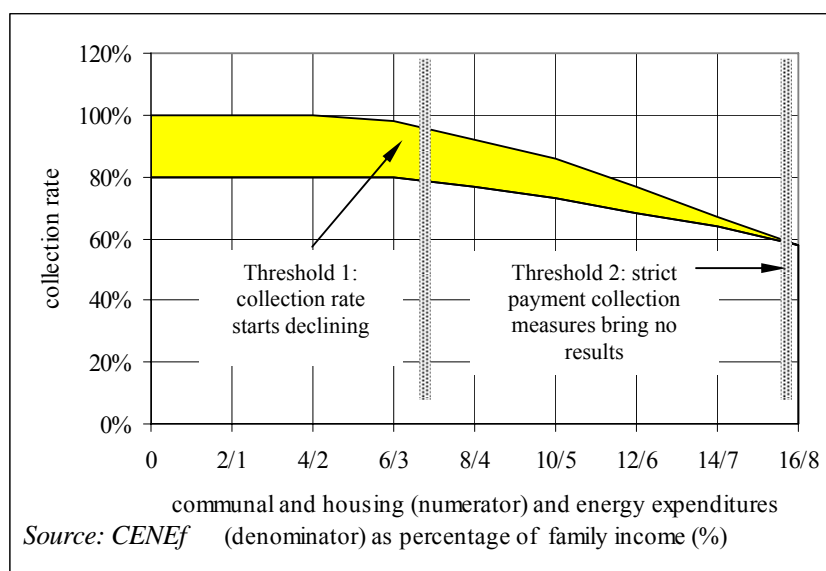


and frequent accidents will occur, all resulting in lower collection rates that trap heating companies in a vicious cycle.

Social assistance has not been adequately incorporated into the heat sector to cover the social consequences of eliminating heat subsidies. The transition economies include some of the poorest countries in Europe and heating bills are a major burden on household budgets. Non-payment has generated large arrears, often bringing heat supply companies to the verge of bankruptcy. There is little focus on consumer satisfaction and customer relations. In cases where heat billing is not based on metered consumption, end use efficiency is lacking, building energy performance is poor, and consumers are usually unaware of opportunities they can exploit to make the most of the space heat provided. Lump-sum tariffs exacerbate the problem, creating no incentives for conservation.

In Russia, after heat subsidies were partially eliminated in 2004-2006 (tariff subsidies were mostly replaced with targeted heat assistance), urban residential consumers pay on average 23-25 US\$/Gcal. Heating and hot water bills account for about 40-75% of total housing and communal costs. So heat price escalation is an important driving force pushing the housing and communal services costs beyond the affordability thresholds. **Figure 10** illustrates the relationship between share of communal energy costs and the collections in Russia indicating that excessive price increases result in lower collections.

**Figure 10. Bashmakov wing showing payment discipline as a function of housing and energy costs (excluding rent and imputed rental value) share in personal incomes**



In Bulgaria, the growing tariffs for heat supplied by the Sofia DHC resulted in mass protests of consumers in the middle of the 2006-2007 heating season, lower collection rates, and as a result the Sofia DC is now on the verge of bankruptcy, as it has generated large debts to the gas supply company.

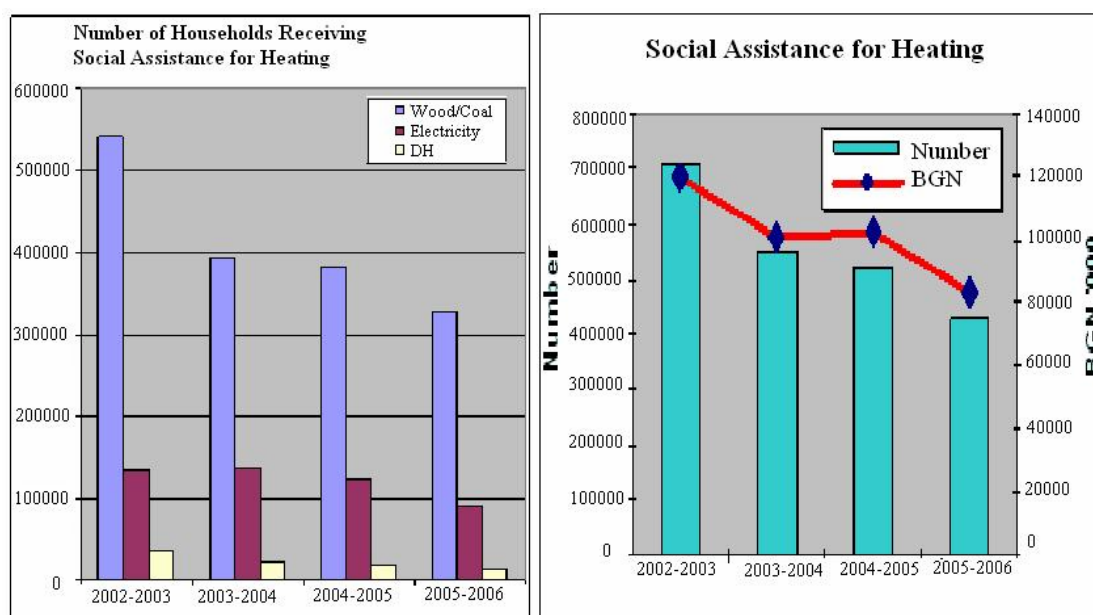
Limits on the ability and willingness to pay are the crucial factors of heat pricing and investment policies to keep up the financial health of district heating companies, and of their ability to finance investments in systems development and modernization out of collected heat payments. To avoid public protest and low collections, the heat price should be kept within the affordability thresholds. The financial health of heating companies should be sought through efficiency, modernizations and technological conversions aimed at the least cost heat supply.

To resolve the affordability issue—since most reform programs start by eliminating heat subsidies—targeted heat assistance programs should step in to provide the social safety net for the most vulnerable households. This will help maintain them as DH customers, improve collections, and most importantly allow for heating options that are efficient, safe, environmentally friendly and affordable

for such families. These, combined with the installation of demand side management (DSM) tools – individual heat metering and regulating devices – can provide DH with the flexibility needed to retain DH consumers. For example, mandatory building-level metering in Moldova created an incentive for saving, and savings between 20% and 50% were registered. . The general trend is that the social assistance schemes have moved from uniform tariff subsidies paid to DH companies towards addressed heat assistance payments targeted to low income households (however, Romania still has cases of fuel subsidies to DH companies).

The elimination of heat subsidies should be accompanied with weatherization programs for those households, allowing heating bills to be reduced in the long-term. In Bulgaria, low-income families receive heating aids from the “Winter Supplement Program” (WSP). The Bulgarian Government spent about US\$45 million on WSP in 2001. Since not enough state funding is made available by the Government, only a fraction of heating bills for low-income households is covered. The number of households supported is gradually going down, and so is the total amount spent by the Government of Bulgaria aiming to phase out these subsidies over time (Figure 11).

**Figure 11. Gradual Phase-out of Social Assistance for Heating in Bulgaria**



In Romania, the WSP equivalent is the heat assistance payment (HAP) which pays for DH, natural gas or non-network fuels during the five months of the heating season. Where possible, the WSP and HAP are paid directly to the utilities. In Romania, the home-owner associations submit collective aid applications to the municipalities, which administer the state program.

Ireland, the United Kingdom and the U.S., where fuel poverty is a major issue due to severe winters, have targeted programs where social funds are used for financing energy efficiency programs for low-income households. The CEE and CIS countries do not have such programs, even though they can help cut heat bills in low-income households, save energy, and reduce the volume of heating aid needed in the long run. A parallel study “Addressing Affordability of Utility Services in Urban Housing: Energy and Water Efficiency Solutions” by the Alliance to Save Energy addresses these issues in more detail.

Cross-subsidies between consumer groups, irrespective of the group paying a lower price, produce a market distortion. For example, in Serbia the residential heat tariff lies between US\$3.5 and 6.0/m<sup>2</sup>, and the commercial tariff is within a range of US\$ 10.0 to 40.0/m<sup>2</sup>. The consumers charged a higher price seek and find cheaper options (e.g. apartment stoves or gas heaters) and disconnect. For instance, in Russia industrial consumers subsidize residential ones, leading to a tendency for industrial consumers to build small, on-site HOB or CHP plants which provide a cheaper and more reliable heat

source. In cases where residents subsidize industry, such as Serbia and Romania, the more affluent households disconnect from the community heating system and install individual heating systems for their apartments, leaving a higher proportion of poorer customers connected to the system, which results in lower overall collection rates.

Cross-subsidies in other utilities, such as gas or electricity sectors, are also counterproductive. For example, in Ukraine the cross-subsidy between the residential and industrial/commercial consumers allowed residents to pay less for gas than the DH companies do (the Government has declared commitment to eliminate cross-subsidies by January 2007, but little has yet been done in this direction). This higher gas cost for businesses is further built into the DH tariff, hence it makes economic sense for residents to disconnect from the DH network (which pays a higher tariff for the consumed gas) and install an apartment boiler system where the lower residential tariff is in force. This has already been done even in pilot projects covering full buildings. The market distortion due to higher gas price paid by DH companies make DH significantly more expensive than direct-gas heating under lower household gas price, such as in Estonia, Latvia, Romania, Poland, Ukraine. In Romania, until disconnections were made impossible in October 2006, massive groups of consumers disconnected from DH and installed individual apartment boilers to reduce heating bills due to cheaper household gas prices. In Romania, the rising gas price for residential consumers was one of the reasons for reconnection to DH, but one million customers had already disconnected and invested in other alternatives, so it is unlikely that all will switch back to DH. Nevertheless, the decision to disconnect from the DH service by either the supplier, or the customer is only easy to implement in the horizontal distribution systems. In the vertical riser systems even disconnection for non-payment has been hard to implement due to the physical structure of pipes.

In the Ukrainian city of Horodok the municipality terminated DH and helped all households of the city install apartment boilers, illustrating the immediate savings from the access to lower gas tariff for heating. Similar transition from DH to individual heating happened in other cities as well, but Horodok was the only one to organize this process on the city level. While the nation-wide scales of such fuel and source switching have not been estimated, 65% of the Ukrainian households are DH users and can potentially disconnect. While the gross output of DH shrunk by half in the economic transition period (2001), the DH continued the steady reduction in output to date (about 1% per year since 2001).

Although the Ukrainian Government has committed to eliminate this unfortunate cross-subsidy, it already left the heritage of many disconnected DH consumers which reduced the efficiency of the DH systems. Hence, the elimination of natural gas cross-subsidies and tariff distortions should be the first step for preserving the economic viability of DH. The Ukrainian Energy Strategy to 2030 envisages further decline of heat output (30% reduction by 2030 in HOBs only), while the market share of the individual heating systems will grow rapidly (roughly 40% by 2030).<sup>10</sup> The most impressive growth is predicted in electric heating (mainly through heat pumps) which is envisaged to grow by some 10,500%. This trend is mainly explained by the lack of coordinated municipal energy planning and local heat plans which would compare and recommend the lowest cost and most efficient heating options for each urban locality.

In Estonia the disconnection issue is addressed by the DH Act where requirements for zoning DH and natural gas areas are foreseen (the zoning is not mandatory and only a small share of cities has carried it out). In Poland, a procedural framework was established: in order to disconnect an apartment in a multi-apartment building the permission of the other owners is required. In Bulgaria, there is no direct competition between the gas and the DH companies, as the urban areas are not both gas and DH supplied. Such cases also happened due to cross-subsidies between fuels in Estonia, Latvia and Poland.

Since disconnection and installation of individual heating was mostly uncontrolled in the whole region, the viability of DH can also be maintained by enforcing safety requirements for individual

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<sup>10</sup> Ukraine: Energy Policy Review. Paris. IEA/OECD 2006.

heating systems (for example, relating to the length of chimneys, fire safety, and the number of individual systems per staircase). In Moldova, for example, not more than 10 percent of the apartments connected to the gas pipeline in one building entrance can install apartment boilers, otherwise the gas system pressure will be insufficient for regular household use. In Ukraine, building codes do not allow individual heating devices to be installed in multi-apartment buildings. Local energy planning is another tool to protect DH from direct-gas competition if household gas supply networks are prevented from entering neighborhoods supplied by DH.

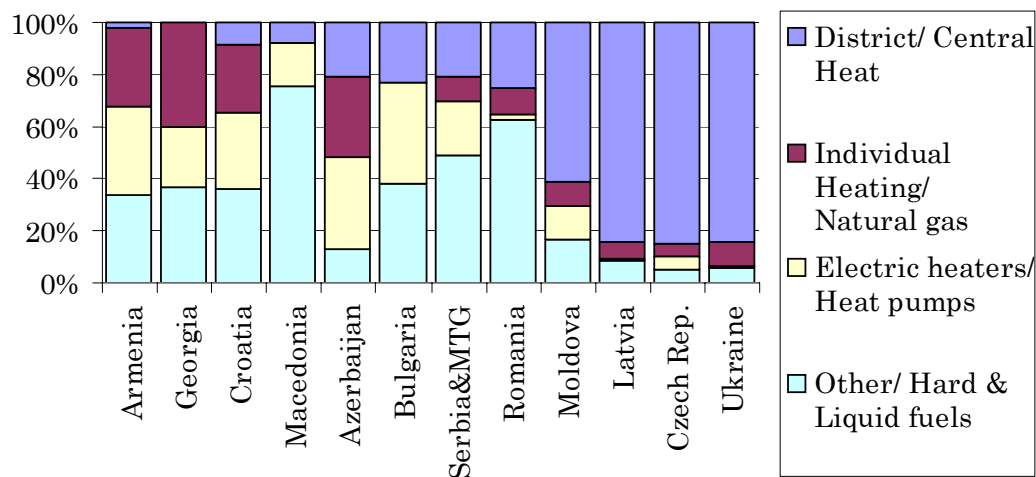
## **Industry Structure, Investment and Competition: Centralized Versus Decentralized Heat Supply**

The evolution of energy sector policies and fuel markets in the CEE and CIS region have greatly affected the heat market. New institutional and ownership models have appeared, along with new technical solutions. Competition, rising fuel prices, social issues, the gradually depreciating district heating assets and poor service quality were the prerequisites for DH losing popularity under the new market conditions which did not limit consumer choice. As utility bills grew as a share of household disposable income, and the demand for more reliable and demand-driven systems was not met by DH, consumers started massively disconnecting from the central heat supply network throughout the region, wherever legislation allowed that (some countries maintain mandatory purchase of DH services in buildings where it is available). This contributed to the growing market niche for decentralized heating options. **Figure 12** reflects the current breakdown in heating options and the structure of urban heat market. As can be seen, district/central no longer holds the lion's share in this market. Electric and natural gas-fired individual heating have grown in market size and recent trends indicate no sign of expected decline in this growth rate.<sup>11</sup> Regardless of the heating option of choice – district heating or decentralized building-level heat supply – the key to efficient buildings and heating systems is access to affordable finance, coupled with effective price setting, service availability and quality, consumer awareness, as well as laws and standards governing energy efficiency in heating systems and buildings. In most cases, lack of investment capital causes inefficiency, high losses, poor administration and management, consequently a high heat price and other deficiencies of the heating service, regardless of the technical solution in use.

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<sup>11</sup> Since any country-wide estimates are not realistic for Russia, no aggregate indicators are available on the heat market structure. Nevertheless, similar to Ukraine and Latvia, Russia is a predominantly a DH country.

**Figure 12. Distribution of Heating Options Used in Selected CEE and CIS Countries. 2005**



*Source: Data collected by MUNEE experts with the following exceptions:  
Data for Azerbaijan were taken from the Azerbaijan Heating Strategy Summary Report. For Georgia: Data from the UNDP/GEF Report on Removing Barriers to Energy Efficiency in Municipal Heat and Hot Water Supply in Georgia. Project # GEO/98/G42*

The controversy of centralization versus decentralization is a major factor determining the future of economically viable district heating systems in the region, as well as preserving and promoting the market for CHP. The new EU member states have more certainty with respect to the future of CHP due to the EU CHP Directive. However, in other countries, if CHP is not promoted by legislation, the rise in decentralized heating may eventually dominate the heat supply market, where heat demand is already declining due to energy efficiency, depriving CHP of the load necessary for cost-effective heat and electricity generation. This threat is particularly acute in Russia where there is no specific policy in the power sector reform to support CHP.

## District Heating

Most experts agree that well-managed district heating systems using best practices and standards are the least cost and most environmentally friendly heating option for cold and densely populated urban areas. On the other hand, under planned economies district heating systems were constructed in all significant urban areas, sometimes with significant overcapacity or excessive centralization. The fuel resources were so cheap that energy costs were never given serious consideration by the planners of the communist countries. Heating plants with excess capacity and long, complicated supply networks supplied dense urban neighborhoods, as well as remote, small neighborhoods. Often, kilometers of distribution pipelines lost significant energy just to supply several buildings. Naturally, commercialization of the heat market revealed the need to disconnect such remote areas.<sup>12</sup> Moreover,

<sup>12</sup> The technical concept of centralized district heating is simple: hot water or steam is generated at a central plant and distributed to buildings through a network of pipes to provide heat and/or hot water by means of heat exchangers. At a more detailed level, generation methods differ as to size and fuel (primarily coal and natural gas), with the major distinction being between combined heat and power plants (CHP) that produce electricity and heat, and heat only boiler plants (HOB) that produce only heat. The distribution mechanisms also differ: CHP systems and large HOB facilities utilize large transmission pipelines that are subsequently transferred to smaller distribution systems through a substation; smaller HOB facilities connect directly to the more localized distribution networks. At the building level, hot water is generally derived through a water-to-water heat exchanger and heat is generally derived from a water-to-air heat exchanger (radiator). The interface between the heat coming into the building and the individual radiators may be direct from the boiler or indirect through a water-to-water heat exchanger.

the economic transition resulted in bankruptcy and closure of large industrial enterprises, which deprived the DH plants of more heat load, making DH systems more inefficient.

Generally, the decentralization of urban heating is viewed as positive trend when the large network solutions with thousands of kilometers of distribution mains are substituted with smaller HOBs supplying a smaller number of buildings (usually up to 20) as modern smaller boilers have higher efficiency and lower prices due to mass production. Nevertheless, DH can be viable and cost-effective under certain circumstances. Technical studies have analyzed the full scope of factors affecting district heating as a heating option and its competitiveness and viability. In summary, the district heating is competitive in the long run under circumstances where:

- (i) heat is supplied to densely populated urban areas where there is a large number of consumers connected per unit length of the heating networks (linear heat load density of over 20-30 GJ/m in most countries, although Swedish DH systems have reached competitiveness under 12 GJ/m density);
- (ii) the climate in the heated territories impose a large number of heating degree days allowing to use the DH facilities for a longer period of time, allowing for faster payback on investments (start-up or upgrade);
- (iii) the densely populated urban areas also have large industrial facilities with demand for district heat and steam, or have their own industrial cogeneration units which need to utilize waste (access) heat through district heating networks supplying the local population;
- (iv) DH provides for fuel flexibility to switch from fossil to renewable fuels, such as biomass, to supply heat with better environmental performance; and
- (v) the taxation and tariff policy may also create advantages for local versus district energy generation or building fiscal incentives into the regulation of the strategically important generation option. For example, purchase price for co-generated electricity established to promote CHPs can make district energy more viable.

In other cases, DH systems are so significantly oversized and ineffective, that switching to other, more cost-effective options is a priority. For example, the Moldova city of Ungheni stopped the DH plant, and converted the four heat distribution points (substations) to HOBs with more efficient boilers, thus eliminating large leakages and pipeline maintenance cost. This is one of the safest alternatives for cities with large DH systems. In other cases, DH systems collapsed due to their poor economic performance before a safe alternative was provided to the population. While more affluent households quickly found good alternatives (such as investing in apartment gas boilers), the poorer residents were left without heat and had to either use the readily available but expensive electricity for heating, or used low-quality, inefficient (sometimes home-made!) wood, kerosene or gas heaters. This is not only a social issue, but also a matter of concern from environmental, safety and building conservation viewpoint.

Decentralization is often the proposed alternative after basic audits are conducted in heating systems of the former Soviet countries (e.g., CENEF's audits of more than 230 DH systems in the Russian Siberia and over 20 DH systems audited in Moldova during the Heat Strategy Development).

Excessive centralization is observed in 75% of Russian DH systems, which supply only about 20% of heat to the market. Decentralization in case of Russia often becomes attractive against the background of the following facts revealed during the audits of more than 230 DH systems in Siberia and in the Russian Far East:

- the majority of heat supply systems (70%) have actual losses in the range of 20-70%;
- expensive maintenance of heat supply networks is responsible for about 50% of overall DH costs;

- the annual replacement rate is only 2%, while the demand is 4-8%, resulting in critically low physical reliability of heat networks and massive losses and frequent accidents (0.6 to 4 accidents/km/year).

All of this, more often than not, results in over- or under-heating of buildings.

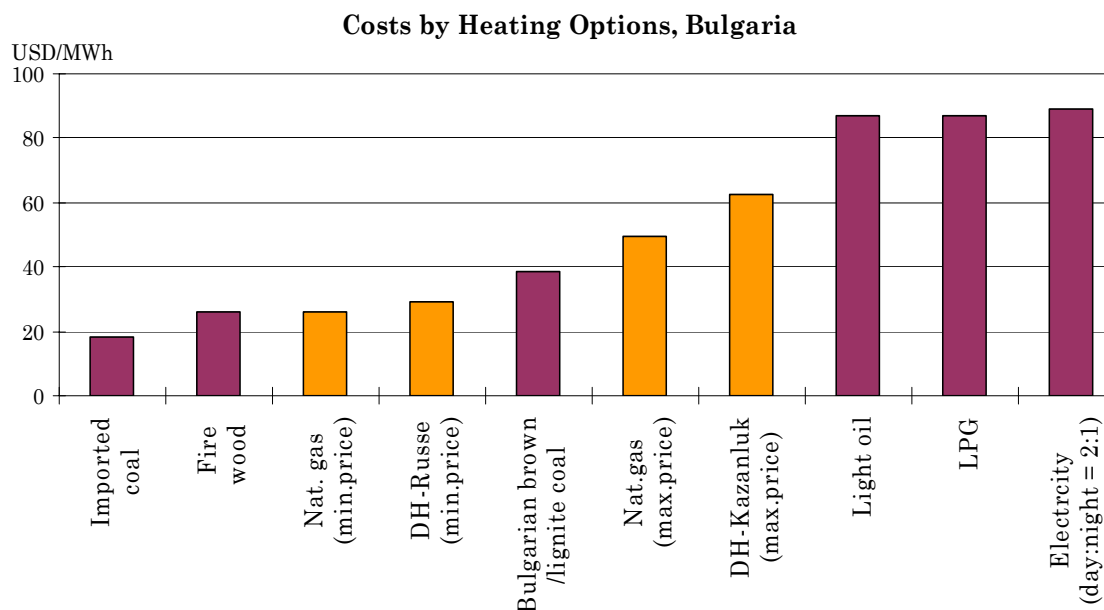
The market-oriented experts recommended that DH was preserved only in urban areas with high population density, and heat was generated locally in remote areas with little heat load density. Before policies and programs embraced these recommendations, in many countries DH collapsed without intervention (e.g. Albania, Armenia, Azerbaijan, Georgia, and Moldova). Even when DH is economically more attractive, the upfront capital investments necessary for building new DH systems cost hundreds of millions of dollars, and are not feasible in most cases. Thus, rehabilitation of centralized heat supply in areas where DH has collapsed only proceeds via construction of heat-only boilers supplying a small group of buildings. Nevertheless, in areas where DH systems inherited from the past economic formation are still operational, and their efficiency can be improved at reasonable cost, it is usually recommended that they be maintained and modernized.

Unfortunately, even the most efficient DH systems are threatened by disconnections, if market distortions favor other heating options over DH. In Bulgaria, where disconnections were among the most significant, the reasons can easily be observed in the cost structure of the available heating options and fuels, as presented in [Figure 13](#). Depending on a locality, the natural gas and DH prices can be comparable. [Figure 8](#) presented earlier illustrated the impact of DH and gas prices on consumer choice of heating options. In many cases, due to extremely low cost-recovery of DH, low cost of heat generation (due to CHP, waste heat, etc.) or very high gas tariffs, DH is cheaper than direct natural gas combustion for heating, which helps DH maintain its customers. In other cases, when cost is equal or higher, the insufficient level of comfort and control provided by the DH can inspire disconnection from DH for individual natural gas heating alternative.

There are three general reasons for disconnecting from DH:

1. Low affordability, which forces low-income households to switch to heating options with more DSM flexibility, such as electric, gas, wood or kerosene heaters.
2. Low service quality, inspiring affluent and demanding customers to switch to heating options with better control over quality, such as apartment boilers.
3. Distortional gas pricing, charging a higher price for industrial consumers (including DH companies), and lower for households. This motivates switching to any direct-gas heating alternatives, such as gas heaters or boilers, creating negative economic, environmental and safety consequences.

**Figure 13. Comparison between different heating options in the residential sector in Bulgaria, 2005**



Source: Eneffect

To address the above issues, a strategic approach is necessary to the scales of residential gas supply, fuel pricing and cross-subsidies, affordability, heat supply quality, and DSM opportunities (described in the *Urban Heating Affordability* section earlier in this report). These issues should be handled not only from a sectoral or municipal perspective, but also from the national, regulatory dimension to effectively maintain the competition between heating options to maintain least cost and highest efficiency.

To ensure that efficient heating is available in the urban areas of the CEE and CIS countries, massive investments and capacity building efforts are necessary to either maintain or improve efficiency of DH, or established decentralized heating and create the capacity of responsible entities to maintain them. To attract investment in district heating (or other energy services) countries in the region are, to varying degrees, reforming economic and energy sector policies to encourage development of the energy services market. One such policy is to impose strict budget constraints on subsidies. For example a government might apply sanctions on non-paying customers and no longer make up budget shortfalls experienced by heating companies. Another reform is to allow prices for energy services to rise (or fall) to reflect actual costs. Reform has taken many other forms as well—it has not proceeded along a “one size fits all” path and available data do not support a clear link between particular reforms and improved economic performance of the heating sector. With that said, however, this paper provides a brief review of experience in selected countries that provides a useful background for developing a set of common standards for assessing the extent to which the heat sector in a particular country will attract investment.

Investment is, in general, very difficult in declining markets. Venture capital investors will have little or no interest in DH markets in the absence of substantial potential for revenue growth. Revenue growth will almost certainly be limited in transition economies with a reduced industrial demand for heat—even when offset by improved returns due to efficiency—not to mention residential customers hoping to disconnect for cheaper and more reliable heat service. Among the major heating markets of the former Soviet area, Lithuania and Poland experienced growth in heat demand in recent years. The



heat demand in other formerly planned countries has stabilized and even indicated a small growth trend in demand for district energy after 2000.<sup>13</sup> This is mainly linked to the following factors:

- ◆ The economically unjustified systems have either already collapsed or low density areas were disconnected, making the supply to remaining customers competitive;
- ◆ The recovery and growth of the transition economies creates demand for more industrial and commercial heat energy; and
- ◆ As welfare of the population improves, the demand appears for larger housing space per person. The expanding housing stock, which chooses to connect to centralized heat supply systems, creates additional demand.

## **Decentralized (Local) Heating**

Decentralized systems comprised of heat-only boilers, connected to one or several buildings, are smaller systems compared to DH and do not have long distribution networks, minimizing system losses. Boiler houses are often built on the foundation of old neighborhood DH heat distribution points, or even on the building roof-top, feeding one building only. The decentralized systems are easier to control and regulate in terms of the length of heating season and temperature.

The vulnerability of smaller systems is related to the loss of economies of scale and scrupulosity of calibration – if the effective heat load reduces by a small share of disconnecting or absentee households, the operational cost (heat tariff for consumers) grows significantly and can result in conflicts with remaining customers.

Since cost minimization is the key concern of the consumers, often the consumers initiated disconnection from DH and decentralized heating. In Poland, Moldova and Armenia home-owners' associations have united to establish decentralized heating. In the Moldovan city of Ungheni the Municipality made a decision to eliminate DH, since DH was not cost-effective due to the low heat load density. The town was divided into four small neighborhoods supplied by local heat-only boiler houses installed on the bases of local distribution points. This eliminated the long distribution pipelines and the large losses associated with them.

The local heating schemes are usually the choice of consumers dissatisfied with DH. Hence, consumer groups need to find their own financing to establish such systems. In Armenia, the World Bank-assisted Urban Heating loan program was designed to lend to home owner associations (HOAs) for rehabilitation of centralized heat supply in multi-apartment buildings. Extensive capacity building for HOAs and legal reforms allowing HOAs to borrow would allow them to better manage buildings and finances and become credible borrowers. If the legal barriers for lending to HOAs are eliminated, HOAs can design and implement efficiency projects, partner with energy service companies (ESCOs), and provide better services and contribute to the social, environmental and economic well-being of the community.

It is noteworthy that decentralized heating is a relative concept that depends on the size of a given city. The term “decentralized” is used to refer to one to five building systems in some countries. In others, such as Russia, the term can refer to small residential districts with dozens of buildings, which in perspective should be referred to as small DH systems. In countries with large, oversized DHSs, decentralization into smaller DHSs is highly recommended based on the heat load density of the network.

In most of Russia—in 75% of DHSs, which supply about 20% of heat to the market—there is excessive centralization of DH. The heat load density of many centralized DHSs is beyond the boundaries of high DHS efficiency (normative losses below 5 to 7% and actual losses below 10 to

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<sup>13</sup> International Energy Agency, *Coming in from the Cold* (Paris: 2005); *District Heating and Cooling*, EuroHeat and Power (Brussels: 2005).

15%), and is even beyond the marginal boundaries of DHS efficiency (normative losses below 15 to 20%; actual losses below 20 to 30%). In addition to poor design, the poor maintenance of DH networks leads to extra losses ranging from 5 to 35%.

Moreover, the number of heating degree days is to be added to this picture to make it consistent region-wide. Small-scale DHSs require additional capacity reserve to meet peak demand. Hence, large DHSs have lower specific investment costs per unit of produced heat. But when heat losses are over 10%, this benefit disappears and decentralization decisions start to become economically viable. Therefore, zoning of the city by density of heat loads to avoid conflicts of centralized and decentralized heat supply systems interests is the key for municipal energy planning. Hence, large DHSs can only stay attractive if appropriately managed and applied in localities with high heat loads densities. **Box 2** presents the optimal decentralization as a factor of heat load density using the example of 190 Russian cities.

## Individual Heating

The biggest competitor to district heating is individual heating, where each apartment has an independent, locally controlled heat source, such as electric or gas heaters, or gas boilers. The substitute comparable to centralized heating is the gas-fired direct, apartment-level heating through stoves, heaters or boilers. In emerging markets, consumers tend to make short-term decisions: individual heating systems usually have lifetimes of 6 to 8 years, while centralized heat supply systems usually have lifetimes of 18 to 20 years. Nevertheless, households prefer paying for short-term solutions. The apartments with individual gas heaters experience uneven heat dispersion, condensation of vapor in colder rooms—resulting in mould on walls and rotting window frames—and discomfort and health consequences related to the temperature fluctuations.<sup>14</sup> Most importantly, individual heating leaves the general building construction and infrastructure without adequate thermal protection during winter months. For example, although all apartments in Armenia have some form of individual heating installed (heaters, stoves, boilers, heat pumps, etc.), and every winter water and sewage pipelines freeze and even explode in multi-apartment panel buildings, causing major disruptions and expenses. When choosing individual heat supply, households often disregard these and other externalities, which, if internalized, will significantly increase the seemingly low price for individual heating, and make it comparable to or even more expensive than centralized heat supply (which also has economies of scale).

Regardless of the individual heating system chosen, disconnecting only a portion of the DH customers in a building disturbs the hydraulic and thermal balance of the system, and increases the share of fixed costs per apartment for the remaining consumers.

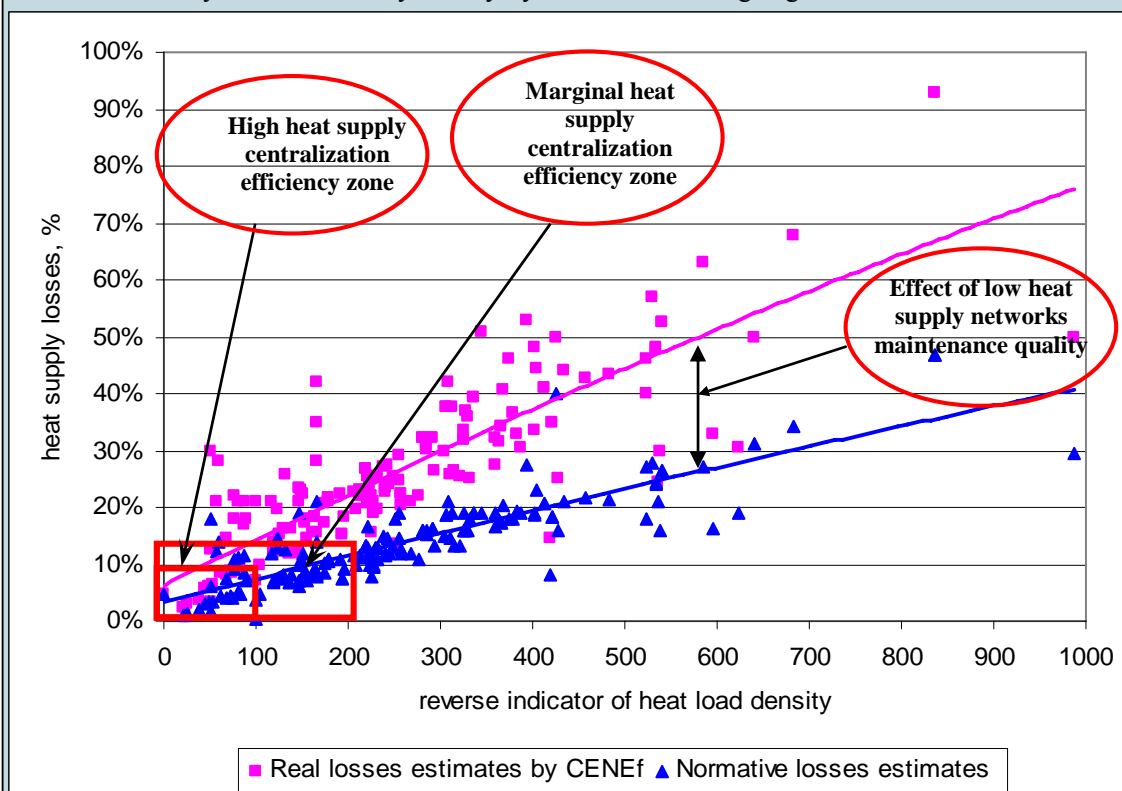
In this respect, national-level heating strategies have an important role in striking the balance between various heating options available in the market, eliminating market distortions, and protecting district or local heat supply to ensure the viability of the most efficient heating options. To summarize, a strategic approach is necessary to the issues of residential gas supply, fuel pricing and cross-subsidies, municipal energy planning/zoning, affordability and heat supply quality and DSM opportunities. These issues should be handled not from a sectoral or municipal perspective, but rather from the national, regulatory dimension. Social assistance, metering and control, independent regulation, fair pricing and building energy efficiency are necessary prerequisites for the healthy development of the heat market.

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<sup>14</sup> This problem is more accelerated by the change of wooden windows with insulated, double-glazed PVC or aluminum windows, which limited the ventilation in the buildings (where no forced ventilation is available), while the poor insulation of external walls resulted in dew (condensation) point being inside the apartment, instead of outside the external wall.

### Box 2. Evaluation of heat losses in DHSs as a function of heat load density in a sample of 190 Russian DH Systems

The key to a long lasting discussion on the economic attractiveness of DHS centralization is in measuring heat load densities. There are different approaches to do this. CENef has developed an indicator, which is the ratio of material characteristics of the heat supply system in form of a reverse indicators (average pipe diameter multiplied by the length of DHS pipes to attached heat loads). The chart below shows the relationship between heat losses and reverse indicator for 190 Russian DHSs audited in 2003 by CENef in Khanty-Mansiysky Autonomous Okrug- Ugra.



Source: CENef. For more details see Russia country paper "Urban Heating in Russia: Experience from the Transition and Future Directions" at [www.munee.org](http://www.munee.org)

# Experiences and Policy Options

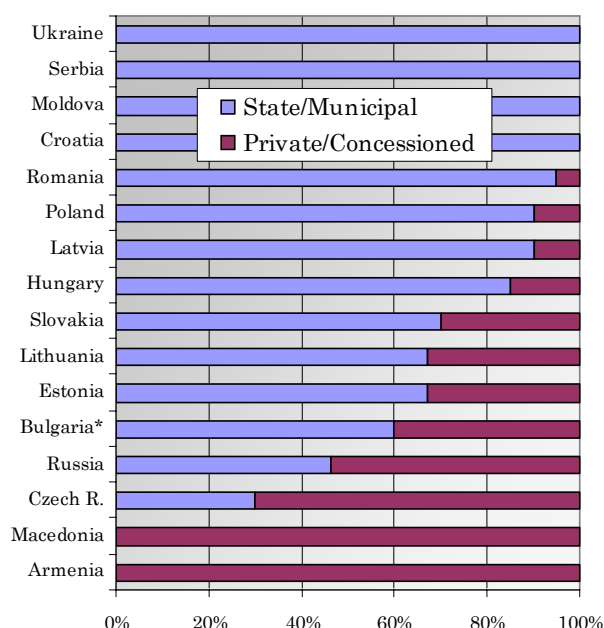
## Chapter

# 2

**Transforming ownership of heating assets** is an issue that has the potential for affecting the future of district heating and its institutional structure. About a decade ago, the heating assets were predominantly under municipal or state ownership. As shown in **Figure 14**, the CEE countries have predominantly created legal provisions for privatization or private sector participation in district heating enterprises, resulting in partial or full privatization of some enterprises, as well as concessions. As a result, the region's heating assets have a fair distribution of various ownership types. This has not only attracted investments into the heating sector, but also introduced effective management, transparent accounting and bookkeeping, improved customer service and quality control practices. Private sector participation if developed in an unstructured, uncoordinated manner, can produce inefficiencies in the heat sector. For example, if CHPs are privatized and DH companies remain municipal, and the municipalities have liberty of choice of suppliers, the municipal enterprises will be given priority, while private CHPs will be left under-loaded. This will cause an overall rise in heat and electricity prices, as the most cost-effective option is not used.

**Opening the heat sector to private participation** has produced a myriad of institutional and ownership schemes in all countries ranging from municipally owned to fully privately owned. Private ownership has been largely on the supply side, while there is more municipal ownership of distribution networks, provided as leases to private operators. The entry of private ownership has eliminated the opposition to DSM that existed when municipal suppliers used the space-based billing method: if a DH company charges according to the square meters of heated space, it has no incentive to eliminate losses since all costs are passed on to the consumer. With consumption based metering, on the other hand, losses cannot be tied to consumers, particularly if only a part of the system has metering, leaving the supplier to pay the unaccounted for costs associated with losses. Privately owned heating companies are also more interested in efficiency because they are not subsidized by municipal budgets.

**Figure 14. Ownership Structure of DH assets**



\* - At the moment of this writing, all DH enterprises in Bulgaria, except from Sofia DHC (60% of total DH sector) had already enrolled in PSP

Source: data collected by authors, OPET CHP/DH country report for Lithuania (2003) and EuroHeat & Power 2005 Survey for Hungary, Czech Republic, Estonia and Slovakia

The entry of new private entities into the heat market under concession contracts was not always positive: in a few cases the new operators came with no experience or inadequate skills for operating a heating service or underestimating the scale of investments necessary for achieving adequate efficiency of the DH systems. They also sometimes had an incomplete understanding of the customers' affordability threshold, which if crossed results in lower collection rates. In some cases, newcomers have to experiment with billing approaches, tariffs and other service terms, frustrating

customers who are accustomed to constant terms and conditions, resulting in low satisfaction and lower collection rates, and sometimes even disconnections. These can be categorized as rare cases, largely affected by the lack of information on the real scale of investments necessary and insufficient efforts directed at customer relations, necessary for changing the peoples' mindset regarding the commercial heat supply service. In addition, the national and local governments were not always well prepared for the introduction of and cooperation with the private sector and often had unrealistic expectations. These issues are illustrated in **Box 3** with examples from Romania, Armenia and Poland, along with the exemplary, successful private participation experiences from Poland, Macedonia and Estonia.

***The promotion of the energy efficiency services market*** was instrumental in offering energy efficiency solutions to apartment owners, condominiums/home-owner associations, and industrial and commercial heat consumers, in addition to more efficient, affordable and reliable decentralized heating options. The availability of ESCOs accelerated the introduction of metering, regulation and other DSM and efficiency solutions. In many cases, district heat companies are neither willing nor ready to embrace full metering on an apartment level due to the ownership gap in the housing sector: privatized apartment owners are partial owners of the building common space, yet common infrastructure such as heating or water supply pipes do not have a clear ownership in many countries. As a result, the internal networks are poorly maintained and have large losses, which will remain unaccounted for if apartment-level metering is introduced. Instead, block metering of heat consumption on a building level creates incentives for the building owners to eliminate losses in the internal networks. External network losses are also quite large, and the heat distribution companies are solely responsible for them.

***Metering and DSM measures***, motivated by the growing heat tariffs, result in reduced demand, which in turn triggers further tariff growth on the supply side to cover fixed costs and unaccounted losses. Moreover, if a large district heating system is only partially metered, the customers without metering devices, billed by consumption norms, bear a heavier burden of the costs associated with the losses. The instabilities emerging from the market acceleration of central heating services largely depend on the scale and density of the heating systems. While larger systems adapt relatively easier, smaller systems with lower network density face major difficulties in balancing the systems, matching investment needs with the limited collection revenues, and generally maintaining a cost-competitive business under pressure from competition and threat of losing clientele.<sup>15</sup>

***Heat pricing reform***, on the other hand, is an important tool that may or may not create stimuli for private sector participation, investments in energy efficiency and competition for other heat supply alternatives. Heat supply as a utility service must consider local circumstances, such as employment rate, revenues of citizens, and heating degree days. With this regard, pricing should be flexible to incorporate local factors. Throughout the region, heat tariffs are generally set by the national-level regulator, which may have local branches depending on the size of the country. In a number of countries, however, municipalities still maintain the tariff-setting role, which is counter-productive if they are partial owner of the heating system.

***Replacing heat subsidies with targeted heat aids***, or furthermore, designing and implementing energy efficiency programs for low-income households, has generally been the best practice in countries in the advanced stages of heat sector reform. Middle-income groups, however, will be stressed by the elimination of subsidies unless widespread and thorough efficiency improvements are made to reduce heating costs. Targeting social assistance has not been adequately incorporated into the heat sector to cover the social consequences of eliminating heat subsidies. The transition economies include some of the poorest countries in Europe and heating bills are a major burden on household budgets, especially given the dynamic fuel price growth in this region.

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<sup>15</sup> For Russia, calculations by the Russian Center for Energy Efficiency (CENEf) show that in buildings with heat load below 0.2 Gcal/hour, potential savings will never cover meter service and maintenance costs.

### **Box 3. Some Successful and Unsuccessful Experiences with Early Attempts with DH PSP**

**Successful: Poland** has one of the richest experiences in introducing private sector participation in urban heating sector. The systems in cities of **Kalisz and Walbrzych** are two of the noteworthy examples. In both cases, the municipal DH utilities were transformed into joint stock companies, long term (10-15 years) lease and performance contracts were signed with competitively selected contractors. Modernization plans included fuel switching, replacement of old boilers with new, efficient automated HOBs, replacement of pipes, etc. The large scale investments resulted in significant improvement of the system efficiency (8 percent in Kalisz), doubling or even tripling of the value of the companies' assets, lower price than the average for the country, improved quality and reliability of service, while the companies' profits continued to grow. Similar examples are available in many other Polish cities, in some cases through leasing or performance/operation contracts, in others – through partial sale of DH companies' shares to foreign companies to attract investment. Introduction of private management, rather than the change of ownership over DH assets, was the key to the effective modernization and improved economic operation of these companies. These and other examples (Bydgoszcz, Katowice, etc) are described in more details in Annex 2.

**Successful: In Estonia** the sale of shares and 30-year concession of the **Tallinn Heating Co** was organized through a tender the evaluation criteria of which favored high concession payments; limited price growth; improved economic and financial operations; and experienced business management. The selected Dalkia subsidiary Tallinna Küte took over all assets, rights, liabilities, employees and agreements of the Tallinn Heating Co under so called “enterprise transfer” concept for the concession period, along with commitment to comply with the service features, environmental, safety and security requirements, monitoring rights and extensive reporting requirements for the concessionaire; as well as set tariff caps; etc. defined by the city administration. As a result, the city received 210mln.EEK initial payment and is receiving annual concession payments; the lack of cash for investments was solved well; the losses reduced and profitability has increased; and the service quality improved significantly. A significant portion of money from consumers goes to the city budget and can be used for other purposes.

**Successful: In Macedonia**, private participation in the DH sector is the most advanced: 100%. The largest Macedonian DH company Skopje Toplifikacija JsC with social capital was privatized in 1999 transferring ownership to the employees and the pension fund.

**Unsuccessful: In Romania**, a few cities took the concession approach including municipalities of Ploiesti, Cluj, Alba-Iulia and Sinaia, selecting DALKIA as the operator of their municipal DH plants. While this approach yielded some positive results in Ploiesti (65,000 apartments), all the other cities had cancelled the agreements for non-satisfactory results. In Alba-Iulia the DH activity was even stopped. In the municipalities of Targu Ocna and Sfantu Gheorghe (Covasna), concessions yielded the worst results. The selected concessionaires did not follow the clauses of the concession agreements, stipulating modernization investments and efficiency improvements of the local plants / thermal substations / heat grids, while they started to sell the old equipment or to use subsidies for different activities. DH systems in these towns are no longer operational.

**Unsuccessful: In Armenia**, the municipal boiler houses and heat distribution points were leased to private businesses, with the condition of resuming heat supply service. With a few exceptions, the new operators have either entirely failed to restart the heating service, or in one case under a Dutch-Armenian joint venture, a small-scale heating system was rehabilitated for 4 buildings, but due to system deficiencies and failure to find an effective billing mechanism, heat supply was terminated.

**Unsuccessful: In Poland** cases are known when the private contractor had the heat prices calculated on very high level (several times higher than average heat price for the country) and heat users were not able to pay heat bills (e.g. in Wieliczka). The private companies increased heat prices to a very high level basing on a contract signed with customer, but end users were not able to pay heat bills. Recently contracts with those private companies are cancelled. In some cases, the contractor interrupted heat supply (even during winter heating season), because of low collections. Sometimes, the prosecutor and civil court and, in several cases also PERO, were engaged in arbitration of the disputes between DH asset owners and contractors. Dramatic situation occurred in some places (e.g. in Miechow) where private heat supplier stopped heat delivery in wintertime and the municipality took over DH assets from that supplier by force.



If the social safety nets do not effectively address the heat affordability for low-income households, collections will drop, the DHC will not have sufficient means for O&M, service quality will suffer – apartments will be under-heated, the heating season will shortened, and frequent accidents will occur. All of this results in even lower collection rates that trap heating companies in a vicious cycle. Non-payment has generated large arrears, often bringing heat supply companies to the verge of bankruptcy. There is little focus on consumer satisfaction and customer relations. In cases where heat billing is not based on metered consumption, end use efficiency is lacking, building energy performance is poor, and consumers are usually unaware of opportunities they can exploit to make the most of the space heat provided. Lump-sum tariffs exacerbate the problem, creating no incentives for conservation.

The urban heat policy options and their implementation by the regulatory and public administration are described in the following section.

## **REGULATORY AND PUBLIC ADMINISTRATION**

### **Role of the Government and National Policies**

One of the predominant goals of policy reform in the heat sector is attracting investment. In transition economies, any incentives that the state can offer should be allocated to only high priority areas. Hence, heat sector policy should be based on the current and future needs of the sector, as well as general national social, economic, environmental and strategic considerations. Heat sector policy, driven by the government, needs to be based on serious analysis that includes the following:

#### **Conduct National Level Strategic Planning**

- ↳ Evaluate the current and potential energy sector needs and the role of the urban heat supply in the strategic objectives of the sector's development, including evaluation of sectoral efficiencies, potential for fuel conservation, identifying need for and planning legal and regulatory intervention in collaboration with the local authorities.
- ↳ Assess the current factual (not norm-based) heat consumption and analyze the cost-effectiveness of current supply practices depending on heat density.
- ↳ Define the strategic objectives for the heat sector, also within the scope of the general energy sector development, with consideration of future needs for electricity generation, environmental concerns, and energy security considerations (including diversification of fuel sources and setting benchmarks for the use of renewable energy and locally available fuels while reducing consumption of imported fuels).

#### **National Policy Development**

- ↳ Assess the economic attractiveness of heat sector investment (such as rates of return on investments, country/sector risks, fuel price uncertainty, and inflation rates), and the barriers to economically attractive investments in energy saving measures (including lack of available capital, collateral requirements, borrower risks, and technical feasibility questions).
- ↳ Identify the need and scope for state involvement to promote investments in the heat sector including national, sectoral and enterprise-level mechanisms. Some policy instruments may include the following:
  - Create or strengthen the role of the regulator to balance the needs and interests of all interest groups and eliminate price discrimination.
  - Transfer heating assets to the local government level. (Note however, that caution should be exercised with respect to possible debts and liabilities of those companies. Once the assets are transferred to the municipalities, they will become the first barrier to economic performance of DH, which happened in Moldova.)
  - Build capacity among the municipal staff and institute a local energy planning requirement in order to identify the least cost heating option.

- Provide incentives for energy efficiency and the use of CHP and renewable resources in the heat sector, such as tax exemptions, customs waivers, mandatory purchase requirements and preferential tariffs for CHP electricity.
  - Provide soft lending instruments using state funds and attracting development credits from IFIs and donors.
- Develop a strategy for implementing heat sector improvements including an action plan and investment program that address the imminent needs of the sector.
- Developing laws and normative acts necessary for the implementation of the above strategy, which may include sector-specific legislation such as addressing the liberalization of the sector, unbundling, establishing the role of the regulator, CHP requirements, emission norms or trading schemes, technical norms and standards, and building energy performance requirements.
- After consensus is achieved on strategies, and once municipal heat plans, technical solutions and political directions on the need for additional involvement are in place, the urban heat sector can be opened to private sector participation (PSP). PSP should be managed in a transparent, fair and supervised process.

The **Table 2** below illustrates the progress made in the countries of the region with respect to the development of the legal framework necessary for promoting efficiency, modernization and viability of urban heat supply.

**Table 2. Legal Frameworks: Comparative matrix of laws relevant to urban heat sector in CEE and CIS countries**

| Country               | Energy Law | Electricity Law | Natural Gas Law      | Heat or DH Law               | CHP Law | EE Law   | Building EE requirements                 | Municipal Heat/ Energy Plans |
|-----------------------|------------|-----------------|----------------------|------------------------------|---------|----------|--|------------------------------|
| Armenia               | +          | —               | —                    | Pending                      | —       | +        | Pending                                  | Provision in heat strategy   |
| Bosnia & Herzegovina  |            |                 |                      |                              | —       |          |  |                              |
| Bulgaria              | +          | —               | —                    |                              | —       | +        | +  |                              |
| Croatia               | +          | +               | +                    | +                            | —       | Policy   |  |                              |
| Czech Rep.            | +          |                 | —                    | -                            | —       | +        | +  |                              |
| Estonia               |            | +               | +                    | +                            | —       | —        | +  | +                            |
| Georgia               | +          |                 |                      |                              |         |          |  |                              |
| Hungary               |            | +               | +                    | +                            | —       | +        | +  | +                            |
| Kazakhstan            |            |                 |                      | +                            |         |          |  |                              |
| Latvia                | +          | +               | —                    | -                            | —       | —        | +  | +                            |
| Lithuania             | +          | +               | +                    | +                            | —       | —        | +  |                              |
| Macedonia             | +          |                 |                      |                              | —       | Strategy |  |                              |
| Moldova               | +          | +               | +                    | Strategy passed, law pending | —       | +        | Technical requirements for new buildings | +                            |
| Poland                | +          |                 |                      |                              |         |          | +  | +                            |
| Romania               | +          | +               | +                    | +(PU)                        |         | +        | +  | +                            |
| Russia                | +          | +               | +                    | +(draft)                     |         | +        | +  |                              |
| Serbia and Montenegro | +          |                 | National Action Plan | +                            |         | Strategy | Strategy                                 |                              |
| Ukraine               | +          | +               | +                    | +(2005)                      |         | +        | +  |                              |



Undoubtedly, the number of laws passed is only a relative indicator of success in sectoral reform. Nevertheless, the legislation developed and passed indicates political will for reform. In many cases the legislation is ambitious but lacks enforcement due to lack of capacity, market failures, lack of financing, readiness of the private sector, public awareness, and many other reasons which are addressed in the present report with respective recommended solutions offered.

The new EU members of the CEE region are now significantly driven by EU legislation. The European Union has started a process of revisiting energy efficiency targets on the regional as well as national policy agendas. The Green Paper on Energy Efficiency released by the European Commission in June 2005 reviewed the existing issues and actions with respect to the current energy situation. The next step calling for stronger energy policy was the Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy, adopted in March 2006. The subsequent document released by the European Council in October 2006 was the Action Plan on Energy Efficiency outlining priorities and actions in order of urgency.

Legislative support for the energy efficiency policy initiatives had started long before, and was pursued by the European Commission through a number of programs and directives addressing efficiency in urban heat sector from generation to end-use in buildings. The Directives included: energy performance of buildings; promotion of cogeneration; energy end-use efficiency and energy services; energy efficiency requirements for boilers, refrigerators and fluorescent lighting ballasts, and others related to energy efficiency at large. For the urban heating sector in the EU Accession countries, these European Directives have served as a major boost to promoting the supply- and demand-side efficiency of heat supply through the promotion of CHP and improved building thermal performance, particularly with the help of EU structural funds. **Annex 2** provides a summary of EU legislation relevant for urban heating sector. Through PHARE and TACIS, the EU has supported energy efficiency activities since 1990/91 in CEE countries that are now EU member states.

In CIS countries the urban heat policy is still very much focused on ownership and regulation, rather than pursuing least cost solutions, efficiency and investments. After initial regulatory and ownership decisions are made, the policy addresses metering and commercialization. In most CIS countries, cost minimization, environmental performance and incentives for efficiency upgrades and modernization are still not on the top of the policy agenda.

## **Role of Municipalities**

Municipalities have been and still remain important players in urban heating. Even in largely privatized heating systems, municipalities have to remain closely involved with the sector due to the following key features of local government:

- local government is responsible for territorial development and municipal energy planning, closely related to utility infrastructure;
- local government is the owner of large pieces of land and numerous buildings (including those used for boiler stations), which often makes them a property leaser (access grantor) as well as a significant consumer of heat supply service;
- local economic developmental, environmental, social, educational and other cross-cutting issues are municipal responsibilities; and
- being the owner of heating facilities and buildings, the municipalities are usually not capable of attracting financing themselves due to their poor financial performance and low credit-worthiness.

All of the above have close linkages with the urban heating business. In most countries, the national policy tasks described earlier in the section on Role of the Government and National Policies for conducting National Level Planning are delegated the local government/municipalities. In addition, municipalities usually own the district heating assets.

The role of municipalities in urban heating sector includes analysis and programs targeted at the following:

- ↳ Identify potential customers and respective heat loads which can be connected to existing central heating systems (often at minimal costs, utilizing existing capacity) to improve the economic performance of the system in the short-term.
- ↳ Estimate the current optimal heat supply capacity necessary in the short-term and the needed modernization measures.
- ↳ Evaluate the energy saving potential of existing systems (from generation to distribution and end use). Common immediate measures needed in most transition countries include:
  - Installing heat metering and control equipment (building and/or flat-level);
  - Rehabilitating the DH networks;
  - Rehabilitating the DH substations;
  - Replacing central heating points with individual substations, where feasible;
  - Modernizing the heat generation facilities, including upgrades for increased CHP production; and
  - Implementing building thermal insulation measures.
- ↳ Estimate the investments and government interventions necessary to utilize the energy saving potential. Prioritize and schedule them according to their feasibility, cost-effectiveness, financing requirements and interrelation with the others, which in most countries fall into the following priority ranges:
  - **Low-cost short-term measures:** Improved efficiency of end use and DSM (installation of metering and control devices, balancing heating networks to ensure low energy intensive and high quality service). *Policy interventions that can promote this include building energy codes, regulatory requirements on metering and customer relations prescribed in the supplier's license, debt amnesties for installing metering devices, and government support for investments in low-income households.*
  - **Medium-cost, mid-term measures:** efficiency improvements on the supply side to improve the cost efficiency and competitiveness of centralized heat supply. This involves more expensive measures such as replacing the oldest, damaged portions of the networks, eliminating network leakages, and renovating substations.
  - **Cost-intensive, long-term measures:** such as weatherizing buildings, replacing windows, replacing all networks with pre-insulated pipes, modernizing generation plants, introducing more CHP, and expanding the network to connect new customers.
- ↳ Evaluate the heat demand expected in the medium and long-term, the available operational capacity, and the ability of the sector to respond to future heat energy needs. These estimates should take into consideration local economic development as well as national-level macroeconomic trends.

Where DH stops functioning, and the DH stations and network facilities are in demand for decentralized heat supply, the municipality privatizes or leases the DH assets through cost and private access schemes that have a significant impact on the viability of urban heating.

In cities with operational DH systems, the municipalities have a number of choices:

- **Municipal or state heating company:** where the municipality is responsible for the economic performance and liabilities of the heat supply, and is in charge of ensuring adequate collections, O&M, return on investments, and service quality; system operators are hired employees. These companies are usually heavily subsidized by state or municipal budgets. This organizational scheme is acceptable when all or most of the buildings served by the heating system are municipal. The weakness of this scheme is that as soon as heat subsidies become unavailable, these companies are on the verge of bankruptcy.
- **Limited liability company:** a more frequent used option of municipal heat supply is one where the municipality is not economically liable for the losses of the heating service, leaving the company to operate as any other private entity, responsible for ensuring cost recovery, efficiency,

and collections. This organization scheme is practiced in the CEE and CIS countries in cases where the heat supply service is not economically viable or only marginally so, allowing the municipality to avoid accountability for the potential bankruptcy of the DH Company.

- **Municipal utility holding company:** It is common for CEE and CIS municipalities to unify the utility service provision in a holding (similar to the Soviet “Zheks” responsible for all communal utilities). A holding allows for joint billing and collection for all services, smaller seasonal fluctuations in financial streams, and optimized supervision, management, maintenance and administration of services.

Largely municipal or state ownership remains in Serbia, Moldova, Romania, Ukraine, and Central Asia. In most cases, there is no homogeneous organizational structure in the heat sector. In Ukraine, for example, all heating networks are owned by municipalities, the large-diameter heat mains are owned by the Ministry of Fuel and Energy, the large CHPs are state-owned enterprises, while smaller CHPs belong to electric utilities and industrial enterprises. The “teplocomunenergoss” operate as intermediaries between the producers and consumers, but municipal companies (zheks) are in charge of collections.<sup>16</sup>

The most important role of the municipalities is the local energy planning, notably the development of municipal heat plans, which provide the basis for creating a regulated and optimized environment in local heat supply. **Box 4** describes the components of the municipal heat plans, which address the techno-economic aspects of heating options appropriate for various urban zones by their heat load density, and feasibility of rehabilitating or restructuring existing heating infrastructure based on lowest unit cost of supplied heat.

After the municipal heat plan identifies the best option for each zone, estimates the investments necessary, the associated impacts and tariffs, it is the role of the municipality to facilitate the implementation of the plan through:

- Identify the investment financing mechanisms for implementation of the municipal heat plan, such as involvement of ESCOs as financing mechanism, providing credit guarantees, loans, carbon financing, initiating partnerships with private sector, such as leasing, concession, etc.;
- Select the best heat tariff mechanism ensuring high collections and cost-recovery addressing tariff size, mechanism (e.g. two-tier), metering, allocation of costs between heat and electricity in cogeneration (if within municipal capacity), etc.;
- Demand-side management and building rehabilitation with support to housing associations;
- Better subsidy targeting to ensure that low collections do not hamper the payback on investments and smooth system operation;
- Ensure good management (municipal or private); and
- Public information campaign to educate the population about the relationship between the increased tariffs and improved service quality and comfort.

#### **Box 4. Components of the Municipal Heat Plans**

Municipal Heat Plans contain the following information:

1. Zoning of the urban area by construction density and heat load density;
2. Calculation of annual heat demand by zones;
3. Review of costs and benefits for various heating options (centralized and decentralized) for each zone with consideration of payback on investments, tariff mechanism and sensitivity to consumption, fuel savings (between options and compared to status quo), environmental impact.
4. Recommendation of the best option for each zone based on:
  - the lowest implementation cost (modernization, rehabilitation, restructuring)
  - the lowest service price
  - the least adverse impact on the environment

<sup>16</sup> *Ukraine: Energy Policy Review*. IEA/OECD. 2006.

## Heat Pricing and Regulation

### Retail Tariff Systems

Consumption-based billing has proven to be a prerequisite for the rational use of heat energy. It provides economic incentives to final consumers to save energy through changes in the behavior and implementation of energy efficiency measures. Experience from many CEE and CIS countries shows that consumption-based billing will typically reduce final consumption by some 20% to 30% compared with the lump-sum tariff system, provided that the heat supply was sufficient before consumption-based billing is implemented (measured results from Germany and Poland are documented in the MUNEE Heat Pricing Study).<sup>17</sup>

A two-part tariff with an energy charge covering variable costs and a capacity charge covering fixed costs has significant advantages. Both the energy charge and the capacity charge have built-in properties suited to promote efficiency. The energy charge stimulates energy savings, provided that consumers have appropriate technical means to control and regulate the heat supply. The energy savings and correspondingly fuel savings become immediately effective. The capacity charge can stimulate the rational use of capital goods. DH systems in CEE and CIS are typically significantly oversized with harmful impacts on efficiency. Providing consumers with the ability to adapt the ordered maximum heat load according to their real needs will make available more heat supply. In the short term, this can be used to supply new consumers, and in the longer run the DH components can be downsized in the course of normal replacement investments due to wear and tear. In both cases, efficiency is improved.

A well designed two-part tariff system almost eliminates the volume risk both for customers and suppliers. The volume risk is mostly caused by sales fluctuations due to climatic conditions and larger reductions of the final heat demand particularly in the transition countries due to structural changes.

Consumption-based billing has some technical prerequisites: installation of heat meters for space heating, heat or flow meters for domestic hot water, (thermostatic) valves, and heat cost allocators. Eventually this requires that a constant flow regime be converted to a variable flow regime, which will require larger investments.

Many CEE and CIS DH systems have already been rehabilitated and modernized to some extent, but without subsequently implementing a new tariff system. In this way, only a part of the potential efficiency improvements can be achieved. Moreover, consumers could reduce their heating bills if a consumption-based billing system would be applied. A new, consumption-based tariff system hardly makes sense without investing in the rehabilitation and modernization of the DH system. Although a new tariff system can be implemented either after the rehabilitation program is complete or in parallel with it, the disadvantage of waiting is that opportunities to save energy and costs have been missed and, even more dangerous, that disappointed customers disconnected from DH in the meantime. In addition, opportunities to downsize the components in accordance with reduced demand have already been lost.

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<sup>17</sup> The cities of Rostock and Erfurt in former East Germany (Deutsche Demokratische Republik) offer a good opportunity to assess the changes that occurred due the comprehensive rehabilitation and restructuring process in the former DDR. The district heating consumption of Erfurt was reduced by approximately one-third within the last 15 years mainly due to DSM measures. In Rostock, the peak load decreased from 445 MW in 1992/93 to 375 MW in 1998/99. During this period, disconnections resulted in a reduction of the connected load by 201.3 MW, while new customers contributed 183.9 MW of connected load. Accordingly, the connected load fell slightly from 590 MW in 1992 to 576 MW in 1990. The specific heat consumption in the residential sector went down from 260 kWh/m<sup>2</sup>, yr in 1992 to 135 kWh/m<sup>2</sup>, and yr in 1998. The full load duration hours (related to the connected load) went down from 2252 hr/yr in 1992 to 1564 hr/yr in 1999, demonstrating that the supply system was considerably oversized.

## **Determining the Costs of District Heating Supply**

Except those tariffs that are politically determined, all rational pricing approaches are in some way based on the accounting costs. Accounting costs can be corrected or modified by the regulator, but eventually they constitute an important basis for determining the tariffs. In case of the cost plus or cost of service regulation. Tariffs are fixed according to the actual or modified accounting costs and in case of incentive regulation they constitute a baseline tariff. Therefore, having clear rules for determining the cost base has an essential impact on the final tariffs.

Accounting costs in most CEE and CIS countries constitute the basis for tariff setting. Accounting costs are, however, historical, while tariffs should cover future costs (i.e., costs incurring in the coming heating period). If tariffs are solely determined in compliance with the accounting costs, DH companies will typically experience losses or reduced profits due to increasing input prices. The problem can be mitigated by adjusting accounting costs to use input prices prevailing at the end of the respective accounting period, as these will be closer to the prevailing prices during the period in which the tariff is valid.

Some regulators allow accounting costs to be adjusted with input prices expected for the respective period. They are in practice, however, rather restrictive regarding the scope of input prices that are may be adjusted and the size of adjustments. Ideally, such an approach would be supported by a one-year business plan, or preferably one with an even longer term.

Applying a price adjustment formula (price escalator) gives the DH companies the required planning security and minimizes the work and expenses of the regulator. For consumers this method is obviously less comfortable since input prices generally increase automatically as heat tariffs increase. To mitigate such effects, regulators usually allow such formulas to be applied only if input price increases exceed a certain threshold. In addition, price adjustments are usually not allowed for all input prices but only for selected ones, such as fuel costs.

Aside from approaches based on accounting costs and cost forecasts, some countries, such as Armenia, use a “standard” cost approach. Standard costs are determined in compliance with norms (e.g., normative heat consumption), average costs, and other standards. Such an approach does not take into account the actual costs nor does it consider the different conditions that result in different costs. The standard cost approach could be reasonable if the accounting costs are unreliable, but is not a useful tool to promote energy efficiency and performance improvements.

## **Combined Heat and Power Pricing**

CHP is the ideal heat source for any district heating system. It offers substantial benefits compared to producing heat and energy separately, including lower emissions, conservation of fuel, reduction of energy imports, and improved energy security. Various countries still apply the conventional cost allocation method that gives all or most benefits to electricity. Such an approach ignores the fact that DH and CHP depend on each other: the low heat prices of CHP can compensate through for the high capital costs for DH, while DH is often the most important market for CHP. To make CHP sustainable, heat prices must be sufficiently high to compensate for the disadvantages of DH, and pricing methodologies must be transparent and predictable.

It is a distinct EU policy to implement competition in the energy sector wherever possible and to eliminate subsidies in the whole sector. In case of CHP the internalization of external costs is an accepted method to award CHP plants for the environmental benefits which are not reflected in the market prices for electricity.

CEEC regulations requiring purchases of electricity produced from CHP, combined with regulated feed-in tariffs, have in some cases promoted CHP and in others at least allowed CHP plants to survive. Under the pretext of the EU electricity market liberalization, these rules could soon be

abandoned. Whether substitutes such as “Green certificates” will be able to compensate should carefully be analyzed.

**Table 3** provides an overview on the most relevant features of the currently applied support schemes in CEEC.

**Table 3. Support Schemes for CHP**

| Country        | “Must-buy” obligation for electricity                  | Special feed-in prices                | Cost allocation methodology for heat and electricity |
|----------------|--|---------------------------------------|--|
| Armenia        |  |                                       | Physical method                                      |
| Bosnia and     |  |                                       |  |
| Bulgaria       | X  | X (< 50 MW)                           | Negotiated prices > 50 MW                            |
| Croatia        | X (< 10MW)   | X (<10MW)                             |  |
| Czech Republic | X  | X (amount depending on size of plant) |  |
| Hungary        | X  | X ( ≤ 50 MW, efficiency ≥ 75%)        |  |
| Latvia         | X (≤ 4MW)  | X                                     | Proportional method (> 4 MW)                         |
| Lithuania      | Quotas determined by Ministry of Economy               |                                       | Physical and proportional method                     |
| Macedonia      |  |                                       |  |
| Moldova        | X  |                                       | Proportional   |
| Poland         | X (quotas)   |                                       | Negotiated   |
| Romania        | (X) (no real must-buy obligation, CHP should only have |                                       | Proportional method, Actual prices may be different  |
| Russia         |  |                                       | Typically physical method and negotiated prices      |
| Serbia         | -  | -                                     | Negotiated   |
| Ukraine        |  |                                       | Physical method                                      |

(X) means CHP should have “priority”

## Price Regulation

In most CEE cities, DH constitutes a factual monopoly which requires regulations to prevent abuse of monopolistic market power. Today, most if not all CEE and CIS countries have regulatory entities in charge of setting tariffs for DH, licensing, and other tasks. In contrast to CEE, DH in Western Europe was typically from the very beginning built up in a competitive environment forced to compete against established heating systems. That is likely the main reason that DH tariffs are not regulated there. A well-known exception is Denmark where a sophisticated regulatory framework was implemented in the course of time, initially motivated to meet the challenges of the so-called oil crisis in the 70s and 80s.

Initially, all CEE regulators started to apply a cost-plus or rate of return regulation for tariff approvals, i.e. tariff were ideally fixed in compliance with the justified production costs. In practice, however, prices have often been fixed below cost recovery for social and political reasons. The major



disadvantage of such tariff regulation is that it does not provide incentives for heat suppliers to undertake any efficiency improvement and cost saving measures. Moreover, as tariffs have typically been fixed below actual costs, the DH company was not able to raise the funds required for upgrading the DH system.

In contrast to this traditional cost-based regulation, an incentive-based regulation would provide incentives for efficiency improvements and cost savings. In several countries, regulators have already lifted the rules for cost-plus or rate of return calculations, and in some cases have even eliminated this type of regulation. A number of CEE and CIS regulatory agencies already apply or intend to apply price cap regulation, which allows heat suppliers to make extra profits through efficiency improvements. Under this regulation, an initial baseline tariff is determined, which will be valid for a certain period of time (typically between three and five years). During this period all profits remain with the heat supplier. When the regulatory period is over a new baseline tariff will be determined in accordance to the actual production costs and consumers will start to benefit.

In practice, there are several options of regulation based on incentives. Aside from the price cap regulation, revenue cap regulation is applied. Another alternative is to regulate the rate of return over an extended regulatory period of several years using a price adjustment formula that adjusts the tariff in compliance with certain input price increases. The main task however, is ensuring that any incentives chosen are actually effective.

Price adjustment formulas (price escalators) allow the heat supplier to increase the tariff when input prices increase. A price adjustment formula decomposes the total costs into its constituent parts, such as costs for heavy fuel oil, personnel, and electricity costs. For example, an increase in the price of coal allows the tariff to be increased. Typically regulators allow prices to increase only for some selected cost items, particularly fuel costs.

Multi-year incentive based tariff regulation has also a disadvantage. Heat supply companies may feel tempted to reduce service quality and necessary replacement investments to cut costs and increase thereby their profits. Therefore, it needs to be accompanied with regulation (obligations, standards or targets) of quality of service, and of performance (mainly losses). To protect customers, a minimum service level needs to be determined by the regulator. **Table 4** summarizes the key tariff regulation schemes applied in CC and CIS Countries.

## Connection Fees

Connection fees are not an important issue in most CEE and Western European countries due to the low demand for new connections. There are very few new multi-family buildings viable for DH supply, especially with the increasing competition from individual heating systems supplied by natural gas. Whether any connection fees should be requested is therefore more a marketing problem rather than a cost issue.

Connection fees can mean different things. In Western Europe it usually means the cost to connect from the customer's facility to the next distribution line. In practice it covers the cost of equipment that cannot be used by the DH company if the consumer disconnects. In Serbia and China it refers to the customer's cost contribution to the total investment costs of the DH system. However, connection fees are not always asked for. Connection costs can also be included in the capacity charge, either because that the heat supply company never requests connection fees as a one-time payment or because it is a temporary marketing measure.

In the colder regions of Eastern Europe and Asia experiencing fast urbanization, connection fees are an important issue. District heating is usually the sole affordable heating system in these areas, leaving DH companies without competition and free to request a connection fee. Moreover, connection fees can be an important and indispensable financing tool for companies that usually do not have sufficient access to commercial loan financing.

**Table 4. Tariff Regulation in CEE and CIS Countries**

| Country                | Cost-plus/rate of return regulation | Price cap regulation/price adjustment formula  | Revenue cap regulation       |
|------------------------|-------------------------------------|--|------------------------------|
| Armenia                | X                                   |  |                              |
| Bosnia and Herzegovina | X                                   |  |                              |
| Bulgaria               | X                                   | X (planned to start in 2007)   | X (planned to start in 2007) |
| Croatia                |                                     |  |                              |
| Czech Republic         |                                     | X ( weighted average prices combined with price adjustment formula)  |                              |
| Hungary                | X                                   |  |                              |
| Latvia                 |                                     | X (extended regulatory period: 10 years for new CHP, 3 years for others, combined with price adjustment formula)               |                              |
| Lithuania              |                                     | X (extended regulatory period: 5 years for privately operated DHC, 3 years for others, combined with price adjustment formula) |                              |
| Macedonia              |                                     |  | X                            |
| Moldova                |                                     | X (price adjustment formulas for each cost item)   |                              |
| Poland                 |                                     | X (regulatory period up to 3 years, combined with price adjustment formula)  |                              |
| Romania                | X                                   |  |                              |
| Russia                 | X                                   |  |                              |
| Serbia                 | X                                   |  |                              |
| Ukraine                | x                                   |  |                              |

The question arises whether and how connection fees affect the heat tariffs. Connection fees can be treated in an accounting system one of two ways. One is to treat connection fees as reductions to overall investment costs, with depreciation charges and tariffs going down correspondingly. The other is to view connection fees as a cash inflow that will be dissolved (amortized) as revenue over a period that corresponds to the service lifetime of the respective investments. Therefore in cases where the tariff is based solely on cost, the connection fee does not affect the tariff and the DH company realizes an extra profit. To avoid this situation, regulators should treat connection fees as a reduction in investment costs, which would result in a lower tariff.

### Regulatory Agency

A major question with regard to regulation is whether to have a national regulator or decentralized, local regulators. The large number of DH companies that exists in some countries makes it difficult and time consuming for a national regulator to regulate all companies. District heating is a local affair and, accordingly, local regulators are often advocated, as in Latvia and Serbia for example. In practice however, regulation on the local level is difficult and often ineffective and should be avoided. Such an approach has several disadvantages, however:



- 1) The potential conflict of interest between the different roles of local government as (a) owner of the DH company, (b) regulator of the same company, and (c) a political institution that is fighting for voters who are also DH customers.
- 2) Municipalities usually do not have the capacity, including qualified staff, to set up a proper regulatory framework.
- 3) Independence of the regulator is likely more difficult to achieve on the local level.
- 4) As the electricity sector is regulated by the national regulator, a close collaboration and harmonization of interests in case of CHP is difficult to achieve. The same is true in the case of harmonizing the interests of natural gas and DH.
- 5) Regulatory costs may increase (as experienced in Latvia).

A workable compromise would be that the national regulator develops the methodologies and procedures for tariff setting and other issues, while local regulators monitor compliance by the DH companies. The national regulator (or an additional arbitrator) would only be involved in cases of a dispute between the municipal regulator and the DH company.

**Table 5** provides an overview on the distribution of regulatory responsibilities for DH in CEE and CIS countries.

**Table 5. Regulatory responsibilities**

| Country                | Municipal responsibility   | Separate DH Regulatory Agency | Regulatory Agency including DH  |
|------------------------|----------------------------|-------------------------------|---------------------------------|
| Armenia                |                            |                               | X                               |
| Bosnia and Herzegovina |                            |                               | X                               |
| Bulgaria               |                            |                               | X                               |
| Croatia                |                            |                               | X                               |
| Czech Republic         |                            |                               | X                               |
| Hungary                | X (residential consumers)  |                               | X                               |
| Latvia                 | X (heat from HoBs)         |                               | X (Heat from CHPs)              |
| Lithuania              |                            |                               | X                               |
| Macedonia              |                            |                               | X                               |
| Moldova                |                            |                               | X                               |
| Poland                 |                            |                               | X                               |
| Romania                |                            | X (HOB)                       | X (Electricity regulator: CHPs) |
| Russia                 | X (municipally owned DHCs) |                               | X (Others than municipal owned) |
| Serbia                 | X                          |                               | X(CHPs)                         |
| Ukraine                | X                          |                               | X (CHPs only)                   |

## Affordability and Sustainability

Consumption-based billing can tangibly improve the affordability of heating services, since consumers can to a greater extent determine the amount of heat they need and for which they are willing to pay. Under a lump sum tariff system, consumers do not have any incentive (and usually no technical means either) to reduce the heat coming from the radiator. With consumption-based billing the old-fashioned district heating service becomes competitive in the heat market by offering comfort

similar to that provided by natural gas, electricity and other decentralized heating systems, which offer the final consumer extensive control over fuel consumption and cost.

## **Other Centralized Heating Systems**

Energy laws and other laws and regulations covering licensing and tariffs typically define a threshold size over which a plant or company needs to be regulated (typically in range from 1 to 5 MW). There are two major reasons for this:

- 1) The threshold keeps the regulated entities to a reasonable number.
- 2) Lawmakers believed that exempting smaller plants from regulation would promote private investments in the heating sector. This was a major reason in Armenia to exempt heating plants below 5.8 MW from regulation by the national regulatory commission.

There is no doubt that without a minimum threshold, regulatory entities would be overloaded with administrative works and the whole regulatory process could become ineffective. On the other hand, smaller centralized heating systems are affected by similar problems as larger ones: consumers need to be protected, efficiency and environmentally friendly heating systems should be promoted, and sustainability of the sector should be achieved.

Larger district heating systems are typically subject to an “ex-ante” tariff and price regulation by which tariffs and other prices have to be approved in advance, before they may be applied. For smaller centralized heating systems, such efforts would be too costly and time consuming. Instead of applying an ex-ante regulation, certain rules and methodologies may be defined under which these unregulated or unlicensed heating systems have to operate. Such a framework of rules and methodologies could consist of:

- accounting rules (stipulating which costs and expenditures can be charged to consumers);
- billing rules;
- pricing methodologies (defining the conditions under which tariff components are calculated and the two-part tariff system is applied); and
- consumption-based billing (which stipulate the conditions under which heating costs have to be billed in accordance to consumption).

The framework of rules and methodologies used for unlicensed companies should be developed by the same entity that is in charge of licensed heating companies, in order to harmonize both approaches and avoid market distortions. In contrast to the licensed companies, the regulator would not, however, be in charge of approving prices.

Prices and heating bills would be subject to an ex-post control in case the consumer disagrees with the prices and/or heating bill. Rules for such dispute management could again be determined by the regulatory agency and applied by arbitrators, municipalities, and eventually by the civil courts.

## **PRIVATE PARTICIPATION AND MANAGEMENT APPROACHES**

The experience of CEE countries shows that when public heat utilities are in desperate need for cash and investment capital, are poorly managed by municipal staff, provide poor service and insufficient cost recovery, and lack transparency, private sector participation can be the key to improvement. Participation can take many forms: full or partial privatization, concession, long-term operational/management contract, or other similar forms of public-private partnership (PPP). Municipalities are burdened with many responsibilities and the advantages of passing the burden for heating to private companies are many: they are well capitalized and able to implement development projects, and they may have better expertise and focus on heat supply, as well as better management practices that enable private operators to save costs, allowing lower district heating fees.

## Private Sector Participation

The Alliance to Save Energy MUNE program has monitored the opening of the heat sector to private participation over the past decade in the E&E region. The privatization processes take different forms depending on the limitations set by legislation and the authorities in charge of the privatization. DH privatization practices can be generally categorized into two groups: minor privatization and major privatization. In the case of minor privatization, the private co-owner does not play a substantive role in many key functions of heating, which instead remain with the municipal (or state) owner. Private companies are generally involved in heat generation and maintenance, and in financial matters such as accounting and reading cost allocators.

In the case of major privatization, the key functions of the heat provider, such as heat supply and fee collection, are transferred to the private entity. The terms of fundamental privatization should be carefully defined in a contract, and should proceed with detailed regulations on how the privatization should be organized, how transparency and fair selection will be guaranteed, the functions to be delegated, and the rules and requirements with which the private entity must comply.

Major/fundamental privatization is a more common option for private sector participation in the heat sector than minor privatization, and has been widely applied in the CEE&CIS region. It can take many organizational forms; the five most common in the region are described below:

□ **Converting into open joint stock company:** Perhaps the widest practice of the open joint stock company (JSC) option in the region has been Bulgaria. Realized and ongoing privatization deals in the district heating sector in Bulgaria included 14 municipal DH companies, which become open JSCs through public sales of shares at the Bulgarian Stock Exchange Sofia plc. In Bulgaria and the Czech Republic the companies applying for ownership of local DH assets were allowed to choose only one. For example, DHC Ruse was sold to the Russian company RAO, yet the same company was approved to privatize the Varna Thermal Power Plant (TPP). The DHC Ruse was opened for privatization again. The new winner was Holding Slovenske Elektrarne (HSE), for purchase of a 100% stake.<sup>18</sup> The Macedonian DH company of Skopje was one of the first examples of JSC with 100% ownership by shareholders (See [Annex 3](#) for details).

□ **Leasing heating assets and operations:** The best results of modernizing and commercializing DH in the region, particularly in the EU Accession countries and the Baltics, were achieved by leasing heating operations to private entities. In this case, the municipality remains involved through terms and conditions attached to the lease contract. Examples of such provisions are tariff calculation rules, investment requirements, service quality and reliability indicators, accounting provisions, reporting directions, oversight, timeframes, fees, and extension possibilities. ESCOs lease small boiler houses in Latvia and Armenia, in 1999 Vattenfall AB from Sweden signed the lease agreement for the Vilnius DHC, although withdrew in 2 years, and another tender for concession of the DHC initiated. Since April 2002 the Vilnius DHC is under 15-year lease operation by Vilnius Energija, owned by Dalkia International: the agreement includes extensive investments in the network and an initial reduction of the heat tariff for households by 5%. As from 2004, the heating price depends upon gas and electricity prices as well as average earnings and inflation rate. Lease contracts the means of PSP in DHCs in a number of small Polish cities including Walbrzych and Kalisz.<sup>19</sup>

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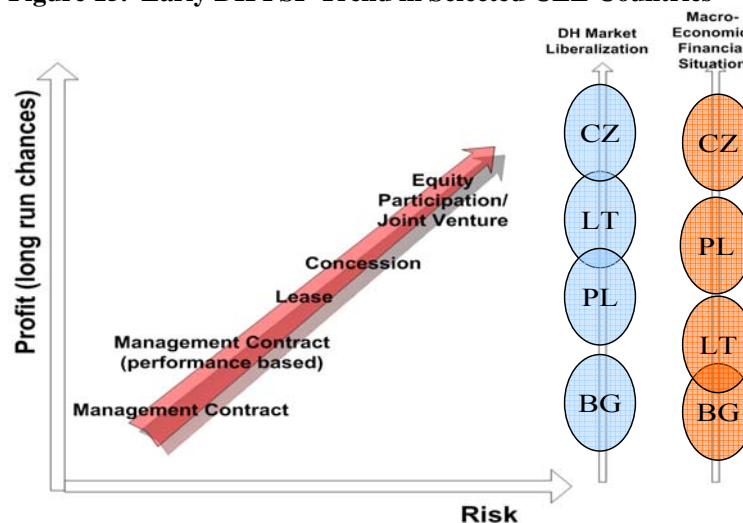
<sup>18</sup> The offer of the Slovenian bidder - € 85.1 million - was preferred to those of French Dalkia and German E.ON, respectively € 51.05 M and € 29.1 million. When the final agreement on Toplofikatsia Russe is signed, Holding Slovenske Elektrarne (HSE) will become owner of a new capacity of 400 MW for electricity production, and new capacities for thermal energy production. HSE also intends to maximize the utilization of two condensation blocks of 110 MW each for electricity generation, as well as providing up to 500 GWh of thermal energy for heating 16,000 residential units in the town of Ruse.

<sup>19</sup> details in Annex 3

□ **Concession:** If privatization takes the form of a concession (in which only the right of use is transferred, with temporary transfer of ownership), the requirements and regulations of system operation are specified in a concession agreement.

The concession agreement should specify the sanctions in case of failure to comply with the stipulated requirements on behalf of the concessionaire (e.g., failure to supply adequate service, or implement specified investments within the indicated period). The heating networks should not be subject for concession, as the transfer of access over such key infrastructure would have monopolistic potential. Considering the heavy public scrutiny over the concession contracts, in Hungary the private entities preferred long-term operational contracts, which had milder competitive bidding and less controversial property ownership issues. Major examples of heat sector concession contracts include the DH companies of Baltics, Romania, Hungary and Poland. For example, a 30 year concession of the Tallinn DH company (Estonia) was granted to a subsidiary of the French company Dalkia International S.A.<sup>20</sup>

**Figure 15. Early DH PSP Trend in Selected CEE Countries**



□ **Joint Ventures:** Another typical business structure applied to the heating sector in the region is the establishment of low capital joint ventures with the municipalities. The municipalities usually keep a majority share (more than 50%) and provide private investors a minority share (e.g., 49%). The private investors generally insist on rights over management because they are making cash investments, while the municipality usually invests hard assets. In such situations, the municipality fully delegates the operations to the private investor, and gradually loses expertise and staff in this field. Eventually, the municipality may lose oversight and understanding of the company operations completely. In a privatization case in Hungary the privatization contract was a 300-page document of heavy legal and technical substance which the municipal staff was not competent to adequately evaluate.

□ **Long-term Operational/Management Contract:** Long-term management or operations contracts are usually used to involve the private sector in small DH systems or single HOB plants; they are rarely used for DH networks. They often take the form of a performance contract between an ESCO and the owner of the DH assets (such as a municipality or housing cooperative), but there are risks associated with this course that should be considered. One potential problem is that the contractor may mainly be interested in maximizing profit and minimizing costs during the limited period of the management contract, and not invest in the stewardship needed to ensure the proper long-term operations and maintenance of the DH system or HOB plant. As a result, after the contract expires, the owner is left with a DH system in poor technical condition. This problem can be addressed by tying management contractor compensation to improved bill collections, system upkeep or implementation of investment plan, and other metrics.

<sup>20</sup> While there is a lot of similarity between leasing and concession, the difference between these two lies in the ownership of assets - the concessionaire owns the DH assets for the term of the concession, while the option of keeping ownership after the contract expires is to be specified in the agreement. For more information on ownership and management options of DH enterprises, see DHCAN at <http://projects.bre.co.uk/DHCAN/guides.html>.

Another potential pitfall is a contractor operating small DH systems or HOB plants who fixes high heat prices and transmission charges. This can occur in some countries where small systems are not licensed or regulated. There are cases, for example in Wieliczka, Poland, where heat prices were charged at a very high level based on the contract (several times higher than average heat price in the country) and heat users were not able to pay heat bills. In some cases contractor interrupted heat supply (even during a wintertime), because of poor consumer payments. Sometimes, the prosecutor, civil court, and in several cases regulatory agencies, were engaged in arbitration of the disputes between DH asset owners and contractors. There are some recent cases where contracts with private companies were cancelled, and in some places (such as Miechow, Poland) the private heat supplier stopped heat delivery in wintertime and the municipality took over DH assets from that supplier by force. The lesson learned from those negative experiences is that management contracts should not be used in the DH sector unless the local authorities have oversight over system operation, which is necessary for the long-term sustainability of the sector.

The general trend of early PSP development in the most advanced privatizing countries of CEE is visualized in **Figure 15**<sup>21</sup>. It is noteworthy, that in the recent years the Bulgarian government has started to pursue full privatization of DH enterprises as the PSP option of choice, however the process has not yet advanced sufficiently to monitor the results.

## Privatization Lessons Learned and Recommendations for Municipalities

The lessons learned from existing PSP cases show that even partial privatization can support local authorities in DH sector restructuring and DH systems modernization. Nevertheless, privatization process in any sector is always controversial and frequently accompanied with disputes and conflicts, usually resulting from the improper preparation of the process and lack of experience. Lessons learned and insights from analyzing the PSP development process in the CEE countries<sup>22</sup> and some successful and unsuccessful PSP cases in the CEE countries can be summarized as follows:

- ✎ In Poland and Czech Republic buying shares of existing district heating companies was the first option (reflecting the strategic interest of private investors in the large heat markets).
- ✎ In Lithuania, leasing was the favored option (reflecting more the need for management improvement on the one side and anxiousness of municipalities on the other).
- ✎ Successful restructuring took place in some large DHC without PSP, either with support from environmental funds or inspired by the big fuel price shocks in early nineties before the continuous deterioration of the district heating systems and financial status started in the light of economic transition.
- ✎ The big deals with selling shares took place after a successful recovery of DHCs and after successful implementation of IFI-financed projects (Poland, Czech Republic).
- ✎ In very few cases, PSP was involved in concert with IFI engagement (such as in Ploiesti/Romania based on concession/lease contract).
- ✎ Equity participation (selling shares) does not necessarily include management assistance nor is the money used for improving the district heating company.
- ✎ PSPs prefer dealing with housing associations (Lithuania, Poland, Czech Republic), not individual flats, which emphasizes the importance of municipal government efforts to encourage creation of HOAs and their further capacity building.
- ✎ In a number of cities, foreign investors built or rebuilt cogeneration plants supplying local district heating systems, where heat supply is usually a by-product, as most income derives from electricity. This is often reflected by simple heat price formulas and flexible heat contracts regarding the adjustment of the heat supply to demand. Accordingly, investors focus

<sup>21</sup> Private Sector Participation. Market Survey. Presentation. Sofia, July 25, 2002

<sup>22</sup> Private Sector Participation: Sofia Toplofikacia. ASE/MUNEE Report. Prepared by Energy Utility Consulting. Sofia, 2002.

on the electricity market, and the incentive for such deals is a preferential purchase price for cogenerated electricity (experience of Lithuania, Poland, Czech Republic, similar process ongoing in Yerevan, Armenia).

- ✎ Companies in PSP deals should have a chance of “learning by doing”. This chance has been missed in Bulgaria. Significant price increases and deteriorating financial companies’ status have occurred without having the chance to improve and modernize the DH systems (e.g. Sofia DHC). If financial crisis has matured already and occurs shortly after the PSP deals are struck, the new owners/investors have to start their modernization programs in an emergency situation, usually accompanied by low customer satisfaction and payment and scrupulous public attention.

Recommendations driven from the experiences of CEE countries most advanced in DH PSP are offered below to help guide policy-makers in better crafting the PSP process:<sup>23</sup>

1. Build political support for private sector participation through public meetings and press conferences that emphasize the expected benefits: increased investment/modernization, efficiency and service improvements, increased comfort, etc. Many citizens are willing to accept this trade-off.
2. Do not initiate PSP without a clear district heating strategy, which should clearly outline whether priority is given to CHP, as investor are most interested in this option.
3. Conduct PSP with sufficient public dialogue, competition and transparency, to avoid future conflicts. There should be political understanding and consensus with regard to the necessity and practicality of privatization between all parties, which would be affected by the concession contract beyond the municipal election cycle. An essential requirement of privatization is a precise and adequate specification and a professional evaluation of applications. It is useful to publish the evaluation criteria and get the evaluation of the proposals approved by the bidders themselves.
4. Anti-corruption measures are necessary to avoid sub-optimal decisions by low-paid municipal officials due to “treats” from rich private entities seeking high profits.
5. Competence of the municipality in the privatization issues is absolutely critical. The municipality itself (rather than an external advisor) should handle the details of privatization. A poorly prepared tender, specification or a contract can become a long-term trap for the community. Regardless of the hired outside help, a wide circle of municipal officials should be able to understand and evaluate the documents and process effectively.
6. After privatization is finalized, there should be enough commitment and expertise within the municipality to follow-up on enforcing the privatization contract. Even if the responsibility of operating the district heating system is conveyed to a private firm, maintain enough expertise within the municipality to be able to follow the compliance with the signed privatization contract.
7. Where the private sector is probably not ready to take larger risks, a management contract would an optimal interim solution.
8. Remuneration based on performance (improvement of collection rates and financial situation, level of heating costs per standard flat, etc) will generate sufficient incentives.
9. To envision and manage risks, the PSP contracts should include clauses on financing investments and ownership of new or reconstructed assets; operation and maintenance performance specifications; policy specifics on pricing, connections and disconnections; role and rights of the municipality; environmental, sustainability and planning strategies; and exit strategy and emergency plan in case of under-performance of the operator, with the designated successor to take over after contract termination.

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<sup>23</sup> Third Party Financing and Energy Municipal Utility Restructuring, by EGI, December, 2002. Available at <http://www.munee.org/go.idecs?i=267>



Overall, the legal reform allowing private participation in urban heat sector has helped attract investments into the heating sector, introduced effective management, transparent accounting and bookkeeping, improved customer service and quality control practices. However, the regional PSP experience revealed the common pitfalls in organizing the process right. In the example of Russian Federation, the CHPs were privatized and DH companies remained municipal, and the municipalities had liberty of choice of suppliers. Naturally, the municipal enterprises were given priority, while private CHPs were left under-loaded, consequently reducing their efficiency, and causing an overall rise in heat and electricity prices.

While private ownership undoubtedly creates efficiency incentives, the heating systems can also efficiently managed under other ownership forms, given the adequate policy, regulation, availability of financing, social assistance, etc. described further. Nevertheless, **Figure 16** shows the least efficient systems tend to be publicly owned, while privately owned systems generally have higher efficiency. The 100% private Macedonian<sup>24</sup> and 70% privatized/concessioned DH assets have very high efficiency parameters, but the largely municipal assets in Poland also have comparable efficiency. In Poland where the World Bank stimulated efforts to create demand-driven systems that led to increased efficiency and environmental funds supported DH modernization to reduce greenhouse gas emissions, despite remaining under public ownership. Many municipal DH systems are still successfully operating under full municipal ownership in Hungary, Germany, Sweden, Denmark, Austria, Finland, side by side with privatized systems in other cities. Sweden, where PSP started since 1990, there have even been cases, when the municipalities have eventually fully repurchased the shares of their previous partner Vattenfall<sup>25</sup> to strengthen local public ownership.<sup>26</sup>

In other cases, IFI assisted modernization efforts preceded privatization to make the utility assets more attractive for private investors (e.g. EBRD loan for Sofia DHC). Nevertheless, in most cases PSP is the easiest and most common choice for municipalities to attract private investment for improving the efficiency of heating utilities, when the city or the DHC cannot borrow and implement modernization unilaterally.

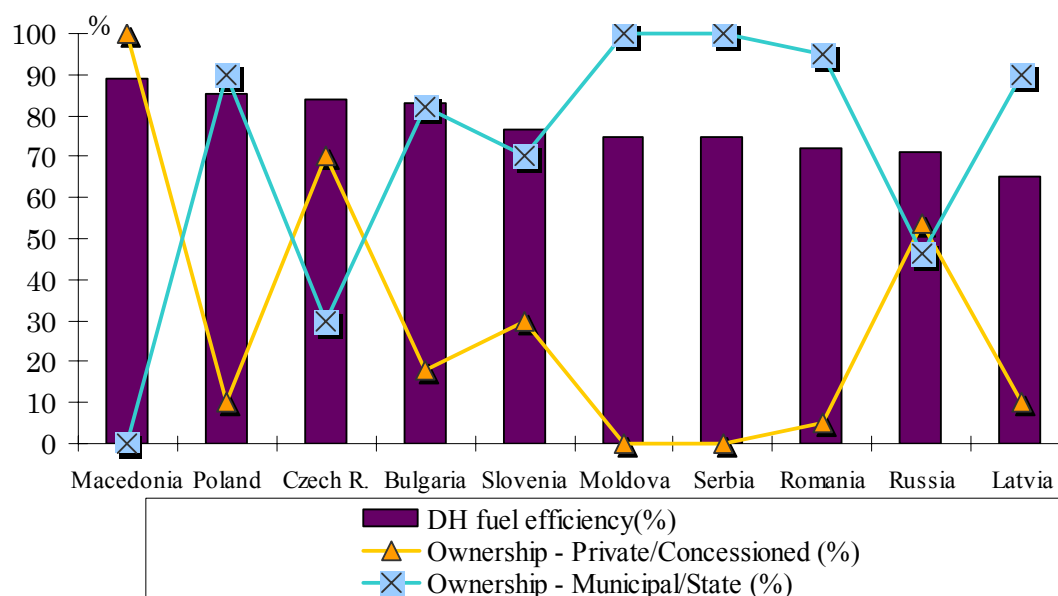
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<sup>24</sup> Hot water production (boilers and other equipment) are 100% private, but distribution network belongs to the State as an asset of public importance.

<sup>25</sup> a state-owned public utility

<sup>26</sup> J.Zeman, S.Werner. *District Heating System Ownership Guide*. DHCAN. Available at [www.euroheat.org](http://www.euroheat.org) and [www.bre.co.uk](http://www.bre.co.uk).

**Figure 16. Efficiency and Ownership of DH in Selected Countries**



*Source: data collected by authors and EH&P 2005 Survey for Czech Republic*

The entry of new private entities into the heat market under concession contracts yielded both positive and negative results (See **Box 3** for examples). They also sometimes have an incomplete understanding of the customers' affordability threshold, which if crossed results in lower collection rates. In some cases, newcomers have to experiment with billing approaches, tariffs and other service terms, frustrating customers who are accustomed to constant terms and conditions, resulting in low satisfaction and lower collection rates, and sometimes even disconnections. These can be categorized as rare cases, largely affected by the lack of information on the real scale of investments necessary and insufficient efforts directed at customer relations, necessary for changing the peoples' mindset regarding the commercial heat supply service.

Annex 3 presents 10 selected privatization cases documented by the MUNEE Program for Hungarian and Polish DH companies, as well as the case of Tallinn DHC privatization

## Energy Service Companies (ESCOs)

One creative solution receiving considerable attention is performance contracting with energy service companies (ESCOs). ESCOs and third party financing have proved efficient and sustainable financial ways to restore and develop systems with greater energy efficiency of the utility infrastructures.

ESCOs are private firms that provide financing, technical consulting, installation, and management services to customers needing efficiency improvements. ESCOs and performance contracting represent a significant and growing business in France, where they were invented, and in the United States where they commonly serve industry, commercial buildings, and public institutions. There are two approaches to performance contracting. In the shared savings approach, an ESCO makes an investment and shares the energy savings with the customer. Reduced energy payments generate cash flow for paying off the investment, providing a profit to the ESCO, and yet saving the customer money. After a few years, all the savings belong to the customer. Alternatively, the ESCO can guarantee savings of a given amount, and if the expected savings are not achieved, the ESCO must pay the difference. This guaranteed savings approach gives the customer greater certainty for budget planning, although as a result of the increased risk to the ESCO the portion of the savings given to the customer will generally be less than in a shared savings arrangement. Allowances are made in the



contracts, of course, for variables such as extreme weather and increased operation or production schedules.

The housing owners associations (HOA), energy contracting and energy performance contracting with energy service companies (ESCO), and the use of the services of private management companies are modern schemes for implementing EE and heat supply projects. Such projects are known in theory in most CEE & CIS countries, but are not widely applied in practice. In practice, successful ESCO experiences to learn from are available in Czech Republic, Poland, Hungary, Bulgaria, Romania, Latvia and Ukraine (Czech Republic and Ukraine even have some state support mechanisms for ESCOs). In Latvia, currently 27 boiler houses are operated by ESCO. ESCOs were particularly successful in Hungary where the favorable legal environment, commercial financing for municipal projects, followed by preferential tariff environment for small-scale cogeneration boosted the market for ESCO services.

A significant amount of ESCO activity occurred in Czech Republic (e.g. Landis & Staefa owned by Siemens) and Slovakia in addition to Hungary, including those supported by EBRD (Dalkia, Siemens, etc.) as well as EETEK/Fondelec. In Macedonia, WB/GEF is establishing an ESCO owned by Toplofikacija and MEPSO; other local ESCOs are Fonko and Energo Sistem. USAID's Enterprise Funds established ESCOs in Romania (Energy Serv) and Ukraine (Energy Alliance), and EBRD and the Enterprise Fund support UkrESCO. In Croatia, within the framework of the Global Environment Facility (GEF), the World Bank established an energy service company (ESCO) within the HEP Group in 2003 – HEP ESCO aimed at developing and implementation of EE projects in industry, public lighting, heating systems, cogeneration plants and energy saving in buildings. US\$ 40 million financing over six years was provided by loans from domestic banks and the World Bank, a GEF grant, equity contributions from HEP and refinancing from HEP and HEP ESCO.

An earlier MUNEE study on Third Party Financing and Energy Municipal Utility Restructuring analyzes the types and prerequisites of successful ESCO projects.<sup>27</sup>

In Bulgaria there are a number of companies, both with foreign participation and Bulgarian, which have declared their preparedness to operate under that scheme and at this stage there are already some projects being implemented either under the energy performance contracting modality or as energy contracting. The projects implemented under the energy contracting modality are usually limited to the level of individual buildings and there is no available information about implemented projects for heat supply of a group of buildings. Some of the very first attempts for implementation of EE projects through energy performance contracting were followed by disputes between the two parties on the subject of payments due to inadequately precise clauses in the contracts. The general conclusion to be made is that the broader development in this field is still forthcoming.

While most ESCOs are privately owned by local entities or foreign businesses (some ESCOs in the region are owned by Dalkia, Siemens, etc.), in some cases they are established by utility enterprises or public entities. Examples are MPEC (an ESCO owned by Krakow municipality), UkrESCO (owned by the Ukrainian State, now undergoing privatization, where the shares of large Ukrainian state energy companies were provided as collateral for the \$30 million EBRD loan), HEP ESCO (owned by a Croatian electric company and in the embryo stage of ESCO development), Hungarian ESCOs owned by local utility companies (E-Partner of DÉMÁSZ/EDF or Synergy of EMÁSZ/RWE, which are meant to help utilities maintain customer service quality<sup>28</sup>). In Lithuania, 23 small DH enterprises established an ESCO New Heat ("Naujoji siluma" JSC) in a joint venture with Finnish Private Energy Market Fund. This ESCO implements turnkey modernization projects and carry out their financing. In Macedonia, MT ESCO has 52% ownership from MEPSO (the state-owned electric transmission company) and 48% ownership from Toplifikacija (the privately owned Skopje district heat company).

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<sup>27</sup> Third Party Financing and Energy Municipal Utility Restructuring. Prepared by EGI Contracting/Engineering under the assignment of the MUNEE Program of USAID and The Alliance to Save Energy. December, 2002.

<sup>28</sup> Coming in from the cold. M.Evans and E.Douraeva. IEA/OESC. 2004.

Nonetheless, as for any market, the energy services market also benefits from competition and the presence of many ESCOs in this market will allow municipalities or other clients to choose the best service provider and not be limited to 1 or 2 alternatives.

The International Finance Corporation (IFC) and the EBRD have attempted to deliver energy efficiency in the region by creating and building capacity of local ESCOs through the provision of equity investment and training. In this way, ESCOs have been created in Czech Republic, Hungary, Poland, and Ukraine. Significantly, the terms provided by the IFC and EBRD for private sector participants in these ventures have been almost identical to commercial banking requirements. Typically, the banks would put up a minority stake with a private western firm taking the biggest share but also involving a local investor. The development banks thus have tried not to distort the market significantly. This approach, however, has slowed their ability to move quickly and aggressively to support efficiency and therefore to accomplish their reform objectives. Negotiations to create ESCOs in Russia and Ukraine were especially slow and difficult.

The ESCO market in this region has produced a limited number of performance contracts which would repay investments from savings. Most companies referred to as ESCOs are merely energy service providers (usually heat suppliers) and the concept of efficiency and energy conservation does not necessarily have a role in their relationship with the clients. The emergence of these ESCO-like companies which committed to leasing non-operational or economically non-viable heating points, converting them to heat-only boilers and rehabilitating heat supply service to multi-apartment buildings has served as a major boost to commercialization of the heat supply service. Such businesses are usually very committed to efficiency of generation and minimization of operational losses. Nevertheless, these companies are not always interested in end-use energy efficiency. Moreover, since such a company sells energy, inefficiency and lack of incentives for saving on the end.-use side would help boost the revenues.

Such ESCO-like companies have developed extensively as small and medium-size businesses in the heat market across the region, and in contrast to the municipal services, devoted serious attention to consumer satisfaction, transparency of billing and collection of fees. The real ESCO market still need many efforts to allow the development of ESCO services in energy efficiency project financing and performance contracting. There are many legal barriers inhibiting the development of ESCOs including legal barriers to maintaining the funds from energy savings on municipal accounts, low attractiveness of energy efficiency projects with long pay-back periods, etc.

## **Role of Consumers and/or Home-Owner Associations**

In some countries the associations of privatized housing owners, referred to as condominiums or housing associations, or home-owners associations (HOAs), or cooperatives, play an important role in the heat sector. These associations, depending on the specifics of the housing privatization process, were necessary to fill the niche of municipal housing maintenance companies (known as *zheks* in the former Soviet countries), which took care of building infrastructures when the housing was under municipal ownership. Because the municipal maintenance was mostly unsatisfactory, as soon as the housing was privatized and new owners had a choice of a maintenance service provider, in many cases the HOAs cancelled their service relationship with the municipal maintenance companies, unfortunately, not always having a prepared substitution.

HOAs have most actively evolved in many countries of the region (particularly in CEE, the Baltic States, Moldova, Armenia), and their number is growing rapidly. Nevertheless, the scope and quality of services and operations they provide is the key to assessing their success. It is noteworthy, that the legislation regulating HOAs/condominiums in CEE and CIS countries varies. The Western and Central European common model suggests that the condominium is only a management body and its board solely selects the contractors to whom the various building-related service provision would be outsourced. In such cases, the role of condominiums is limited to signing the contracts with the utility service providers, such as the DH company, and then with the HOA members to serve as the intermediary and collect the fees (fee collection can also be outsourced). In Poland, for example, housing cooperatives are the best payers for heat supply. This aspect is relatively clear since there is a

service on sale, which is highly demanded by the HOA members, and backed up by willingness to pay.

In other countries of the region the condominiums can also become the service providers. The more complicated scope of HOA functions deals with building maintenance and implementation of EE measures. The HOAs usually perform poorly on these tasks due to lack of funds. The complications usually arise due to the low payment capacity of HOA members, resulting in a low collection rate (or service fees are fixed to low due to social issues); as well as the low awareness of the consequences of poor maintenance of common space. Frequently, particularly in the CIS countries, after the privatization of apartments the HOA members did not gain a sense of common ownership over the areas of general use (such as entrances, staircases, roofs and basements). In some cases, the transfer of ownership from municipal to the condominiums has not been completed or clear.<sup>29</sup> Without such assets, the borrowing capacity of HOAs for any maintenance or EE measures is limited. The solution is usually either state financial support to housing associations, or developing flexible financing schemes coupled with extensive capacity building. For example, in Armenia the condominiums have borrowed for heating projects under an IFI-assisted lending mechanism, through tri-lateral loan agreements where the lender, the condominium and the individual household are the parties to the contract; and the property of the household acts as collateral. In Latvia, the collateral for lending is the condominium cash flow, which, in case of default, would automatically serve for loan repayment, dominating over other financial commitments.

The outsourcing of building maintenance services is less common in the CEE and CIS region. An exceptional and noteworthy experience in Bulgaria was related to a project aimed at rehabilitation of a 60-year old residential block in Sofia through a partnership between the HOA, a Housing Estate, the Bulgarian Housing Association, Sofia Municipality and two Dutch housing associations. The holistic thermal insulation measures were combined with converting the attic space into rental housing, which bring the HOA additional revenues. Surrogate private maintenance companies were identified in Croatia, which operate via contracts between building owners and housing associations, and use the maintenance fees collected by residents.

Instead, most housing associations, in the presence of financing mechanisms, implement the building maintenance and EE measures on their own. Often condominiums seek technical advice from the donor-assisted programs, technical institutes and auditing groups. Gradually, as condominiums gain more experience with such projects, such as in Latvia, the condominiums independently attract loan financing, outsource energy auditing, and implement projects with short to medium, as well as long-term payback period. The motivation for such measures grows as gas prices rise in the countries of the region and energy-related expenditures become more substantial in the household budgets.

Heat sector strategies in some countries (the Baltics, Moldova and Armenia) involve HOAs in organization and/or operation of heating systems. There are numerous successful experiences with heating pilot projects in different cities of Armenia, Latvia and Lithuania, which show that condominiums can effectively organize the rehabilitation/construction and operation of their heat supply systems. However, there are several common fundamental institutional and technical barriers that policy and technical assistance programs should address in order to enable condominiums to fully perform their heat and energy efficiency functions. These include the following:

- Weak capacity for building management, project development, financial planning and management, fund-raising, human resources, reporting and customer/member relations;
- Poor creditworthiness due to short track record and financial performance history, slow development, failure to collect the service fees and conduct creditworthy accounting, bookkeeping and reporting;

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<sup>29</sup> For example, in Armenia the Law on Condominiums grants the common areas' ownership to HOAs, but they do not have a certificate of ownership from the State Cadastre to give them legal title; moreover, to be able to do that, all the common areas would have to be measured, sketched, and certificates issued, as they currently do not exist.

- Lack of financing mechanisms with terms and conditions suitable for housing rehabilitation and building energy efficiency projects;
- Difficulty to guarantee the majority of votes for strategic decision-making with respect to heat supply issues (now even further complicated by the growing number of autonomous apartment-level solutions) and significant share of absentee households (e.g. in Armenia this share reaches ~20%);
- Often need to sign individual loan repayment and service supply contracts with each household due to mistrust and lack of experience of purchasing utility services from the intermediary;
- Lack of clarity in the legal frameworks regulating the housing sector, particularly regarding common areas and other practices that could bring HOAs revenues, as well as lack of enforcement mechanisms for HOA majority decisions for minority households.

The main heating-related activities of already established condominiums should be:

- contributing to the restoration of heating systems in buildings (ensure collective decisions through advocacy among building residents, which will serve as the basis for legally flawless and economically justified contractual agreements);
- designing and implementing building energy efficiency and conservation measures;
- attracting financing for the above measures;
- handling contractual relationship with energy/heat suppliers and help collect heating fees; and
- ensuring the participation of socially vulnerable families in the decision making process, and supporting those families in the process of applying for the financial assistance, being provided to the low-income families for participation in heat supply rehabilitation and weatherization projects.<sup>30</sup>

## **COMMERCIAL AND TECHNICAL APPROACHES: ENERGY EFFICIENCY IS KEY**

The heating systems of the region have witnessed a myriad of projects aimed at modernization and improved efficiency of DH systems. Most of these happened with support from donors and IFIs or with help from private investors under PSP schemes. Many such projects are well documented and analyzed in case studies. Given the policy focus of this report, this section only focuses on the menu of technical modernization and optimization options which have worked successfully in previous projects.

Similar energy efficiency upgrades are often implemented in privatized or concession heating systems where profit-oriented businesses practices are already in place. In other cases policy interventions can promote efficiency of heat supply and end use. Policy provisions on the end use include energy efficiency standards for heat generation equipment and heating networks, certification and labeling programs, building energy codes, regulatory requirements on metering and customer relations prescribed in the supplier's license, debt amnesties for installing metering devices, and government support for investments in low-income households. These, combined with adequate financing and supply-side policy provisions promoting utilization of CHP, waste heat and renewables can help achieve least cost heat supply.

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<sup>30</sup> Possibilities for Reconstructing and Improving EE Heating & HWS – UNDP/GEF

## Heat Sources

Most heat sector reforms start by tackling the inefficiencies of heat sources by eliminating the highest cost supply units, converting heat-only boilers into cogeneration units, introducing efficiency standards on fuel combustion, and limiting emissions. The scope of technical modernization and development of heat sources includes the following:

- Development of combined heat and power production by means of:
  - developing cogeneration in existing HOB plants by installing steam turbines;
  - modernizing existing CHP plants by installing gas turbines, combined steam-gas cycle, heat accumulators, variable speed pumps, etc.;
  - installing cogeneration units (gas turbines or gas engines) in existing communal HOB plants;
  - constructing new mini and small CHP plants equipped with gas turbines or engines; and
  - modernizing existing condensing power plants and its use as a heat source for DH systems in close proximity, together with long distance heat transport.
- Closing down low efficient HOB plants and central heating points and replacing them with substations connected to the DH network, or individual building substations, or replacing coal-fired boilers with modern automated gas- or oil-fired boilers.
- Optimizing combustion processes using automatic controls and other modern technologies such as fluidized bed, low emission burners, turbulent burners, and coal gasification.
- Reducing pollution emission by:
  - reducing fuel consumption by either improving the efficiency of existing inefficient plants or closing them down;
  - switching to fuels with lower carbon and/or low ash and sulfur content; and
  - installing high efficiency end of pipe environmental technologies such as precipitators, exhaust gases desulphurization and denitration.
- Measuring the quantity of heat delivered to the DH network and using automated controls (such as automated variable speed pumps and automatic control of water temperature according to weather and consumer need).

## DH Networks

DH networks are probably the most vulnerable and controversial part of the heat supply chain. While privatization or concession can help channel investments into the supply side, and home-owner associations, ESCOs and metering can help eliminate losses at the end-use, heating networks are often left without due attention because their privatization is undesirable due to anti-monopolistic considerations, and municipal ownership is almost always maintained over the networks. The private operators, ESCOs or HOAs are consequently reluctant to invest in the network rehabilitation, and they usually get investments sufficient to avoid large accidents. Hence, the heat supply distribution networks in CEE and CIS are in dire need of the following technical modernization and development of DH networks:

- Implementing modern technologies, construction, fittings and accessories that have lower heat and energy carrier losses, better reliability, etc (such as flexible pipes, prefabricated and pre-insulated pipes, valves, compensators, and fixed points).
- Installing an electronic system to identify leaks and other damage in the DH network.
- Using automation to make remote measurements and remotely control DH equipment.
- Systematically replacing old pipes and accessories with modern equipment.

## Substations and Receiving Installations

The scope of the technical modernization of the substations and receiving installations includes:

- Incorporating modern technologies in substations, including plate heat exchangers, compact and fully automated substations, modern valves, and expansion tanks.
- Implementing modern technologies and construction for new types of heating installations.
- Installing automatic controls for the delivery and use of heat.

## A TECHNICAL PERFORMANCE AND TRANSFORMATION REVIEW

### Demand-Side Management: Metering, Billing and Collection Improvement

One of the components with which heat sector reform in most CEE countries started was energy efficiency regulations. In recent years in most CEE countries, policy concerning energy efficiency improvement at the end-use level has undergone serious development, usually taking form of Energy Efficiency Acts or Laws and developing short- and long-term energy efficiency programs. These Acts and accompanying Ordinances are related to the introduction of the European Directive on energy performance of buildings, the methodology for building certification in compliance with the European standard EN 832 for Thermal Performance of Buildings, Energy Auditing of Buildings and Industrial Enterprises; Building Energy Certification; and Heat Conservation in Buildings. These provide strict requirements for energy efficiency in the design and performance of buildings. Many European standards have been approved as national standards in the new EU members, such as the calculation methods to be used in building design, for coefficients of heat transfer through the building envelope, and for heat losses.

Along with other provisions, the EE Acts involved demand-side EE management provisions, including heat metering. The metering combined with consumption-based billing enabled consumers to pay according to actual consumption. Initially, billing was norm-based per unit of heated space. However, measurements show that the norms are usually 20% higher than the actual heat consumed per heated space.<sup>31</sup> The norms did not usually take into account the heat releases from humans, appliances and other household activities. Hence, the transition to metered billing was favorable for final consumers, reducing their heat bills by at least 20%. Meters have mainly been installed at the building level, with the meter reading divided between the households (including any losses in common space and on the way from the substation, which may vary from 10% to 30% of total bill). Naturally, such billing creates incentives for conservation, reducing DH company revenues. While, the Heat Pricing and Regulation chapter of the present report addresses tariff-setting issues, it is noteworthy that after introducing metering, DH companies either had to raise tariffs to recover their fixed costs or they had to introduce a capacity charge. The latter approach allows consumption-based metering and sustainable economic operation of the DH companies to be combined.

Since building-level metering is only an indirect incentive for energy efficiency for end-users, individual apartment-level metering and thermostatic valves were legislated and became common in CEE countries. Since most old heating systems use vertical distribution pipes, individual heat meters cannot be installed. This is why heat-cost allocators (HCAs) came into circulation.<sup>32</sup> In most cases, cheap, old-fashioned HCAs are used to minimize cost.<sup>33</sup>

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<sup>31</sup> For example, the experience of the Central Administrative District of Moscow shows, that real heat consumption is 22% below the city consumption norm.

<sup>32</sup> Heat energy billing based on the use of heat cost allocators (HCAs) is carried out in addition to metering the heat consumption of the entire building: the heat emission of each radiator is

The introduction of heat metering was mandated by law in most countries with a significant share of DH. Some examples are listed below:

- ✎ In Czech Republic, roughly half of the DH consumers are equipped with individual metering and regulation devices; the rest still pay by heated space. In Croatia, the legal provision for metering appeared only in 2001.
- ✎ In Hungary, billing based on metering became compulsory in 2003.
- ✎ In Poland, DSM modernization of customer buildings is mainly developed by building owners, supported by the Act on Support for Thermo-Modernization Investment (ASTMI), with state funding for thermo-modernization investments in the initial phase of implementation. According to the heat tariff ordinance of 1998 the measurement of heat became obligatory in every building connected to the DH network. During the 1998-2000, a great effort (financial and organizational) has been made to equip thousands of substations with heat meters in all DH systems. The DHCs are obliged to equip each connection to the substation with heat meter. The systems and heat meters are owned mainly by DHCs, but there are also heat meters installed by building owners (e.g. in compact substations). This was largely promoted by the new regulations that came into force in 1999 implementing a new tariff system based on justified costs of heat production, transmission and distribution. According to this system the two-part tariffs, hence metering, are obligatory for heat sources and DH networks. Since 1994 every new multifamily building had to be equipped with thermostatic radiator valves and heat costs allocators. A large number of existing (older) building were equipping with those devices in frames of Thermo-modernization program.
- ✎ In Moldova, the Energy law mandated heat metering (on a building level) and installation of metering devices by suppliers. The HCAs and TRVs are mandated in new buildings by the building codes. Nevertheless, the legislation was not clear on who should pay for the metering devices and their installation, and end-users were charged for these.
- ✎ In Croatia the new Rulebook on Energy Saving and Thermal Protection of Buildings includes specific requirements for mandatory installation of thermostatic valves and HCA in all new buildings.
- ✎ In Romania, the newly announced “District Heating 2006–2009 – Quality & Efficiency” National Program will ensure both the strategy and the financial means for improving the overall efficiency of DH utilities, financing municipalities to follow the provisions of the National Strategy for DH activities (GD 882/2004). The program has two components: acting on the supply side (plants, transport grids, thermal substations) and introducing metering at each entrance of the connected multifamily buildings.<sup>34</sup>

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“measured” with an HCA. An HCA (either based on the measurement of evaporation or electronic), is attached to each radiator. The HCA does not measure the heat content of the water, but provides a value which is in proportion to the amount of energy emitted depending on the size, shape and material each individual radiator is made of.

<sup>33</sup> Similar apartments in buildings consume various amounts of heat energy depending on their position (those in the middle of the building, with little external wall area, or having large solar exposure consumer less than those on the ground floors or having large external wall area, hence large losses. The convenient location of a “warm” apartment allows maintaining comfort level with supplement heat from neighboring apartments. With this respect, the calculation methods have to take into account the position of the apartment in the building to ensure fair division of the costs. This is usually conducted with application of index factors which discount the heat bills of “cold” apartments due to inconvenient location.

<sup>34</sup> It is considered that based on this program, by 2010 the heat production will reduce by 10 million Gcal/year, against the 2004 level. At present, the annual national heat production is about 26.7 million Gcal (industry and residential sector). The total value of this DH orientated program is 3.7 billion Euro (13.4 billion Lei), of which 3.47 billion Euro (12.17 billion Lei) will be in bank loans, to be returned by the Ministry of Public Administration and Internal Affairs (50%), along with the municipalities (50%). If the benefits of this program materialize, the plants and the DH companies are not allowed to privatize/outsourcing their assets on the activities for a period of five years, from the date of the first operational start. The program is not mandatory for the cities. The Local Councils are also encouraged to participate in public private partnerships (PPPs) or for offering concessions.



- ✎ In Bulgaria, a 1996 government program was responsible for the installation of block meters in the basements of all residential buildings connected to DH. Then the 1999 EE Act initiated HCA-based billing, in the presence of a building meter by September 2002. Although the deadline was not met, by mid-2003 about 90% of consumption was equipped with HCAs.

According to the EU SAVE II study, an average of 14% energy savings was recorded over the 1999-2000 heating season in the 1,320 apartments in one Sofia district that had HCAs and thermostatic radiator valves (TRVs) installed. By 2002, implementation had spread to 500,000 apartments, producing savings of 600,000 MWh. The annual savings of EUR 100-150 per apartment far exceeds the cost of EUR 8 per apartment. Earlier experience in Sofia and four other Bulgarian cities achieved savings of 26% - 50%, about half from building-level meters and half from HCAs and TRVs.<sup>35</sup> The financial benefits of investing 540 million BGL (US\$262 million) to install HCAs and TRVs on all radiators in Bulgaria, assuming that installations will generate average savings of 12 %, are presented in **Table 6**.

**Table 6. Bulgaria - Financial Returns from Installation of HCAs and TRVs**

| Investment |           | Payback Period | Net Present Value |           | Internal Rate of Return |
|------------|-----------|----------------|-------------------|-----------|-------------------------|
| BGL('000s) | USD('000) | Years          | BGL(000s)         | USD(000s) | %                       |
| 54,000     | 26,214    | 2.5            | 109,610           | 53,209    | 39.6                    |

*Source: Philips, M. A Regional Review of Social Safety Net Approaches In Support of Energy Sector Reform Appendix 3*

In Romania, the PHARE-financed program installed TRVs & HCAs in 12,000 apartments, located in 5 municipalities -Bucharest, Fagaras, Oltenita, Pascani and Ploiesti - in late 2005. The above demand-side management measures allowed reducing the heat consumption by 14-61% in 1569 apartments; 101 buildings, which allowed yielding 15-20% monetary saving even after tariff increase. The rate of savings will allow 5.3 year payback on this EUR 5 million project. While the PHARE program was fully grant-funded, the DH Company in Cluj-Napoca, Romania supported the individual metering through a local pooled financing program, installing bulk and individual meters in 218 HOAs (6,000 apartments). 24-month financing was offered to HOAs, with repayment built in to the monthly heat bills. Attracting outside financing from the local council, DH company, vendor credit from VITERRA and a small grant from UNDP/GEF, the households only had to pay 30% of the costs. Overall, the Cluj-Napoca households saved from 15-40% on their heat bills. In addition to substantial energy savings (177 toe energy savings or 7,780 GJ for 878 apartments), the project also yielded significant emission reductions (403 tones CO<sub>2</sub> / year in 878 apartments).

In general, the DSM investments pay back in 3-8 heating seasons. Nevertheless, the cost-effectiveness of investments in control and metering devices is not always obvious, and very much depend on the climate, the number of heating degree days, tariffs, heating loads, investments costs, etc.

In Russia, CENef experience shows that for buildings with heat loads below 0.2 Gcal/hour potential savings are not likely to cover the meters service and maintenance costs. Moreover, installation of meters is not always possible, for example in buildings up for demolition, those with no basement or any other location for a meter installation. Therefore, full metering cannot be blindly mandated. Heat metering programs need to be well-designed for the desired institutional market scheme, and they should allowing for a transition, where necessary, to billing for consumed and metered heat or comfort service, or to more accurate consumption norms for those consumers who are not equipped with meters. One solution would be to delegate the responsibility of installing metering equipment on DH companies in a reasonable period of time set by the government and the regulator. This, followed by introduction of consumption-based billing, would allow commercializing the heat supply, creating conservation incentives and covering costs.

<sup>35</sup> IRG, South East Europe Regional Energy Market Support Project, Final Report Task 4, February 2007.



Many experts unilaterally support transition to flat-level heat meters (HCAs) as a convenient instrument for managing affordability of heat services. HCAs combined with thermal regulation valves (TRVs) undoubtedly help improve indoor comfort, balancing comfort with affordability. Unfortunately, these investments are not always cost-effective. The payback on metering devices depends on a number of factors, such as their price, heat tariffs, climate conditions (severity and length of the heating season) and habits. For example, apartment-level metering in Bulgaria can reduce consumption by 14%; while in Russia the pilot experience of apartment-level metering in Cherepovets reduced final heat consumption by up to 7%. This figure is considerably less than the 15-20% savings consistently reported in other countries.

A quick calculation illustrates the care that needs to be taken when considering the cost-benefits of installing allocators. If four allocators are needed per flat, the lowest possible costs would be US\$ 20 per apartment (depending on factors such as variety, price, quality and the country of production). Annual billing costs in the range of US\$ 12 to 20 per apartment must be added in, since large personnel involvement is necessary for collecting the readings. In some NIS countries, annual heating costs are US\$ 50 to 400 per apartment per season. According to billing practices with allocators, 30% to 50% of the bill is based on the flat space. So annual savings are between US\$2 and \$20 US\$  $[(50-400) \cdot (50-70\%) \cdot 7\%]$ , with an assumption that comfort is not sacrificed. That is less than or equal to annual billing costs, with no savings left to payback investments in allocators.

Notwithstanding the Russia experience, information available from most countries in the region suggests that HCAs are quite cost-effective. For example, the Bulgaria examples on the previous page indicate paybacks from less than one month to 2.5 years. Moreover, if combined with insulation and weatherization measures, DSM measures can save up to 50% of heat energy used.<sup>36</sup>

In Armenia, where DH has almost fully collapsed, there are no legal provisions for heat metering, but installation of HCAs and TRVs is recommended in new local heating rehabilitation projects aimed at ensuring commercialization of heating services. The share of investments required for metering and regulation equipment in the reviewed projects varies between 12% and 25%, which corresponds to additional investments of between \$1.50 and \$4.00 per covered area (square meter), or an additional \$50 to 60 per apartment. Considering that the projects are funded by loans, the HOAs may choose not to commit to additional investment cost. Hence, even if the installation of HCAs and TRVs is cost-effective, efforts are necessary to raise awareness of residents on their benefits.

Considering the current socio-economic condition of the population in most CIS countries, installation of TRVs and HCAs or apartment-level heat meters requires financing. While in CEE countries funding for such programs is made available from state budgets or EU structural funds, in the CIS the lack of financial mechanisms for DSM investments for residential consumers (home-owner associations and condominiums) represents a major impediment to the development of demand-side management and conservation in the heat sector.

In Ukraine, all public buildings (schools, hospitals, and kindergartens) are equipped with heat meters but only 4-5% of residential buildings. In the industrial sector this figure amounts to 35% to 50%. Also, an increasing number of consumers install hot water meters for their private flats. Such meter costs usually pay back within 5-6 months. The predominant scheme for supply heat to flats prevents the installation of apartment level heat meters, particularly in the absence of building level meters, so HCA installation has not evolved. While almost all boiler houses in Ukraine are equipped with heat meters at the outlet, these often “break” because the DH companies are not interested in registering the actual amount of heat delivered to the consumers, which is substantially less than the normative heat. The heat meters would reveal huge losses in the DH distribution systems. Without meters,

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<sup>36</sup> See a companion report by Alliance to Save Energy, “Addressing Affordability of Utility Services in Urban Housing: Energy and Water Efficiency Solutions” which contains documentation and analysis of numerous case studies of residential energy efficiency projects resulting substantial energy saving, reduction of heat loads and bills.

consumers pay for heat on the basis of normative figures billed on occupied space and have to pay for all losses of the centralized heat supply sector.

In any country, until meter saturation reaches the desired levels, many or all customers will still be billed based on consumption norms. The consumption norms need to be reconsidered, since more data on the actual level of heat consumption are available from the analyses of readings of meters already installed. Transition from municipal average consumption norms to average norms based on the type of building is needed to motivate demand for more energy efficient dwellings in the real estate market.

When massive consumption metering occurs, the suppliers switch to a two-tier tariff, to guarantee recovery of fixed costs. The subjectivity of the two-tier tariff where a capacity charge is paid by consumers, in addition to the consumption-based bill, is a mechanism which can also hide large system losses, as well as the infiltration of heat into the apartments of disconnected customers. In this respect, in many cases consumers have expressed concern about the size of the capacity charge (or the individual share of the common bill reflecting the difference between the metered consumption inside homes and the reading of the basement or substation meter). Hence, it is important that the DH companies' financial statements publicly reflect the collection rates and revenues, to assure the residents that there is no over-billing. This, combined with minimum EE requirements for the DH companies, networks and buildings, can ensure that the un-metered part of the system also performs efficiently. More on pricing schemes is available in the chapter on Heat Pricing and Regulation.

The demand for DSM measures stimulated the market for licensed service-providers, who willingly organized the installation of necessary DSM devices in residential buildings throughout the region. Availability of financing was major push to the DSM services market. The emergence of the energy efficiency services market was instrumental in offering energy efficiency solutions to apartment owners, condominiums/home-owner associations, and industrial and commercial heat consumers, in addition to more efficient, affordable and reliable decentralized heating options. The availability of ESCOs accelerated the introduction of metering, regulation and other DSM and efficiency solutions. However, in many cases, district heat companies are neither willing nor ready to embrace full metering on an apartment level due to the ownership gap in the housing sector: privatized apartment owners are partial owners of the building common space, yet common infrastructure such as heating or water supply pipes do not have a clear ownership in many countries. As a result, the internal networks are poorly maintained and have large losses, which will remain unaccounted for if apartment-level metering is introduced. Instead, block metering of heat consumption on a building level creates incentives for the building owners to eliminate losses in the internal networks. External network losses are also quite large, and the heat distribution companies are solely responsible for them.

#### **Box 5. Lessons Learned from Pilot DSM Projects**

- High quality heat metering and cost allocation devices are a critical factor affecting consumers trust towards heat billing and collection mechanism.
- Do not install metering and regulating devices until the following six conditions have been met:
  - 1) Building-level meters are installed,
  - 2) Benefits of metering and demand regulation tools have been explained to residents,
  - 3) residents understand and specifically request them,
  - 4) building heating network is well balanced,
  - 5) additional investment will pay back, and
  - 6) HCAs are not installed without TRVs to allow for demand control.

Heat metering programs should be designed to fit the desired institutional market scheme in a way that allows for a transition to consumption-based billing, or barring that to more accurate consumption

norms for those consumers who are not equipped with meters. While many experts aggressively support transition to flat-level heat meters, or allocators, while highly contributing to commercialization and conservation, this is not a cost-effective solution in all cases. The payback on such DSM investments strongly depends on consumption volumes, tariffs and investments necessary. At the same time, there is a critical need for fuel consumption and heat generation meters at boiler houses, and as well as heat meters at the division boundaries for different agents in the heat supply market. Until the level of metering has reaching the desired level, flexible provisions are necessary to switch between billing options, as some customers will still be billed based on consumption norms. Consumption norms should be re-evaluated periodically as more data becomes available from the analysis of readings where meters have been installed on the actual level of heat consumption. **Box 5** summarizes the main lessons learned from pilot DSM projects.

## **Finance and Investment: Paying for Improvements in District Heating**

Many governments and district heating enterprises claim that lack of financing is one of the major problems in the heating sector, and there are many reasons why financing for district heating investments is not readily available. Three basic problems constraining investment are lack of equity, lack of customer finance, and lack of access to capital markets. Access to finance depends on the credit worthiness of the borrower, the financial parameters of the project, and any mechanisms for credit enhancement (such as collateral and loan guarantees).

One way to look at the financial prospects for district energy systems in the region is to look at the price level—necessary to motivate improvements—and hard budget constraints—necessary to make prices meaningful and investments worthwhile. The presence of these conditions explains the interest of the investors in district energy systems of the Baltics, Poland and Hungary.

Credit enhancement can be undertaken to some degree for systems which have not inspired investor confidence. This otherwise normal practice, however, is made difficult when confusing legal and political structures make it unclear how lenders could recover unpaid loans. Would they be permitted to attach bank accounts or seize assets? Nations can no longer realistically provide sovereign guarantees to back loans and investments in district energy and customer energy savings systems because of the huge transactions costs imposed on governments to undertake them—primarily in the form of time for busy leaders. Moreover, the multi-lateral development banks can finance only a tiny fraction of the region's needs.

The majority of the financing needs of the district energy sector of the region must be provided by the private sector, if it is to be had. But vendors usually are unwilling to finance customers' purchases, and lenders usually are unwilling to finance transactions without a guarantee of repayment. These problems are compounded by the “small project” problem, which is to say that because productivity projects such as efficiency investments tend to be much smaller than the mega-deals in the oil and power industries, transactions costs can overwhelm the deals. Management costs for loans are relatively fixed as are due diligence requirements. Therefore, the cost of developing a \$5 million municipal district heating project or a \$15 million industrial cogeneration project may be financially attractive, but the up-front costs are likely to be the same as for a \$100 million power plant or \$1 billion gas or oil deal. The risk-to-reward ratio tends to be high enough to send financiers looking elsewhere for investments.

Local banks increasingly are making loans to help their customers, including municipalities, remain solvent. These banks have the knowledge necessary to determine whether the loan is likely to get repaid, and provided that the financial assessment is favorable, loans or loan guarantees for municipalities are good business. There are also numerous possibilities for co-financing and pooling the financial resources from the state and municipal funds with the bank loans, IFI resources and residents.

A number of organizations active in the region, including the International Energy Agency (IEA), the World Bank, and EBRD, have all concluded that a number of basic policy measures are needed in each country that fit the countries transition strategy. The IEA recently succinctly stated these policy needs,<sup>37</sup> including establishing or providing:

- Comprehensive energy policy based on either market competition or regulation independent of short-term political goals, with full cost recovery, and least-cost planning principles.
- Tariff structures which reward efficiency and quality of service, not higher costs, in energy transformation, delivery, and use.
- Unbiased, fair, and unsubsidized competition,
- Independent and separate social safety-net support programs.
- Programs to promote demand-side energy efficiency, with metering, control, and weatherization, and with billing for actual consumption.
- Mechanisms to enforce payment discipline.
- Transparency in formulating and administering laws, regulations, tariffs, energy plans, and heating services.

These recommendations are geared toward ensuring that consumers have fair and equitable access to heating services and that service providers have a means of making reasonable profits. These goals can conflict in the most stable economies, and regional transition strategies and political developments can exacerbate the difficulties.

We thus reiterate what many others have found earlier. Tariffs on all fuels as well as district energy must eliminate subsidies and cross subsidies. There must be metered as opposed to estimated heat consumption. Payment discipline must be imposed. Ownership of assets can be public (national, regional, or local), private, or mixed, but hard budget constraints, price rationalization, and provision of market-like incentives must prevail or privatization and competition cannot soon be expected to function. These factors are changing all the time and yet they influence and interact with one another. Subsidies and cross subsidies on gas or electricity can influence the method used to calculate the tariff for district heat.

In Romania, the financing mechanisms were provided as part of the Government reform of the urban heating sector. The Romanian Government has launched the National Building Thermal Rehabilitation Program in 2006, coordinated by the Implementation Unit of the Ministry of Transport, Construction and Tourism. The mayor of Bucharest announced that all 10,000 multi-apartment buildings in the city would be included in this program. The program aims to involve the households and HOAs in energy efficiency projects, providing the incentive of free energy audits, building certification feasibility studies, design work and project M&E, if the majority of households agree (>50%) to enroll in this program. Each HOA member family, living in a multifamily building, will be requested to pay 33% of the rehabilitation costs (about US\$730 – 1,220), which allows them utilizing soft bank loans, offered for 5-8 years.

Concurrently, another National Program for rehabilitation and modernizing the heat and power supply was launched. It followed the Government Decision of phasing out heat subsidies in the residential sector by January 1, 2007 by improving the efficiency and lowering the operation costs and tariffs of heat and power supply. This newly announced “District Heating 2006–2009 – Quality & Efficiency” National Program will ensure both the strategy and the financial means for improving the overall efficiency of DH utilities, bringing its value to the European level. The program will offer funds to the municipalities, allowing them to follow the provisions of the National Strategy for DH activities.

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<sup>37</sup> Coming in from the cold. M.Evans and E.Douraeva. IEA/OESC. 2004.

It is estimated that by 2010 the Program will reduce the heat production by 10 million Gcal/year from the current 26.7 million Gcal. The total value of this DH orientated program is 3.7 billion Euro (13.4 billion Lei), of which 3.47 billion Euro (12.17 billion Lei) will be in bank loans, to be repaid by the Ministry of Public Administration and Internal Affairs (50%), along with the municipalities (50%).<sup>38</sup> If the benefits of this program materialize the plants and the DH companies are not allowed to privatize or outsource their assets on the activities for a period of five years, from the date of the first operational start. The program is not mandatory for the cities. The Local Councils are also encouraged to participate in public private partnerships (PPPs) or for offering concessions. The program was launched in late November 2006. By mid-2007 60 municipal projects have already registered with this program.

Poland's Thermal Modernization Program provides loans and grants to housing associations and public institutions for thermal renovation projects.

The experience of Bulgaria in applying various energy project financing mechanisms – separately or in combination – provides probably the most diverse menu of opportunities the countries can utilize to promote investments in the urban heating sector:

1. State guaranteed credits from IFIs for financing of significant and socially important infrastructure projects, which due to legal, regulatory and other barriers could not be financed with standard bank credits: *Projects for rehabilitation of DHC Sofia and DHC Pernik.*
2. Standard bank credits used for co-financing of large projects and full financing of smaller projects.
3. Contemporary mechanisms for financing of investment projects including financial leasing: *Project for Construction of a cogeneration facility at DHC Varna.*
4. Joint Implementation Projects Mechanism according to the Kyoto Protocol for economically profitable greenhouse gases emission reduction and for attracting foreign investments.<sup>39</sup>
5. Equity. Successfully carried out price reform and implementation of modern methods for price regulation create opportunities for financing of investment projects with equity: *During 2004 the energy sector investments were about 960 million Bulgarian leva, of which 43% is equity.*
6. EU pre-accession funds for financing energy projects:
  - ✎ *Rehabilitation of district heating network of DHC Sofia - €30 million;*
  - ✎ *A financial memorandum for project for rehabilitation of DHC Pernik for the amount of €4.95 million was signed at the end of 2004;*
7. Privatization opening the heat market for private capital and investments, as described in the Privatization section of this report.
  - ✎ *The certified bidders for DHC Ruse had to meet the preliminary qualification requirement for equity amounting to at least €500 million, which provides a financial guarantee for investments in environmental protection and rehabilitation amounting to 1,350 million leva (preliminary estimation);*

<sup>38</sup> Two provisions of the “DH 2006 – 2009; Quality & Efficiency Programs” make it unfavorable to the privatization process: (i) Only the state owned utilities are eligible to get funds through this program; and. (ii) The administration of the municipal DH systems must be ensured by an operator (company), with 95% statutory capital owned by the local authorities.

<sup>39</sup> For example, in Bulgaria projects are underway for rehabilitation of DHC Sofia and Pernik, JI project with Holland for DH Kazanlak, DH Yambol and Polymery JSCo; JI project with Holland for co-generation in DH Plovdiv; JI project for co-generation in DH Bourgas with Denmark; JI project for co-generation in DH Pleven and DH Veliko Tarnovo. In Ukraine, JI projects for DH systems with large numbers of boilers are proposed for Chernihiv oblast, JSC Oblteplokomunenergo; AR Crimea, LE Krymteplokomunenergo; Rivne oblast, DE Teplotransservis; Vinnitsya city, CCE Vinnytsyateplokomunenergo; Donetsk city, LE Donetskmis'kteplomerezha; Dnipropetrovsk city, RCE Dniproteploenergo; Luhansk city, LCCE Teplokomunenergo; and Khmelnytsky city, CCE Khmelnytskteplokomunenergo.

➤ Through investment agreements with the purchasers included in the privatization contracts for the sale of energy companies. Investment agreements with purchasers of DHC Burgas, DHC Gabrovo and DHC Veliko Turnovo amounted to 23.55 million leva, necessary for modernization of processes for production and transmission of heat energy.

At this point, further studies could enhance the climate for financing with recommendations on how to move toward a standardized approach for measuring progress and assessing the impacts of different policies. Measurements of progress, such as a scorecard with benchmarks, could be developed with input from a combination of donor, financial institution, and business planning sources. An example is shown in **Table 7**.

**Table 7. Scorecard on Heat Sector Investment Climate**

| <b>Economic</b>   |  |
|---|--|
| Level of cost recovery  |  |
| Private financing with:   |  |
| <i>Guarantees</i>   |  |
| <i>Liens on assets</i>  |  |
| <i>Soft loans</i>   |  |
| Existence of incentive mechanisms for investments                 |  |
| <i>tax and fiscal incentives</i>                                  |  |
| Share of heat energy billed                                       |  |
| Share of billed heat energy payments collected                    |  |
| Private ownership of assets                                       |  |
| Private sector participation forms possible:                      |  |
| <i>Lease</i>  |  |
| <i>Concession</i>   |  |
| <i>Partial divestiture</i>  |  |
| <i>Complete divestiture</i>                                       |  |
| <i>Full privatization</i>   |  |
| <i>Management contract</i>  |  |
| <i>Other</i>  |  |
| <b>Environmental</b>  |  |
| International agreements in place                                 |  |
| Existence of accounting/tracking framework                        |  |
| Existence of institutional mechanism                              |  |
| Number of CO <sub>2</sub> trades to date (i.e. experience)        |  |
| <b>Social</b>   |  |
| Independent administration of social programs                     |  |
| Coverage of social safety nets (share of total customers covered) |  |
| Share of utility bills covered by the social safety programs      |  |
| <b>Regulatory</b>   |  |
| Cross subsidies within fuel                                       |  |
| Subsidies existing across fuel                                    |  |
| Favorable feed-in tariffs for CHP                                 |  |
| Tariffs set nationally, regionally, or locally?                   |  |
| Approved alternative heating sources available                    |  |
| Are procurement procedures clear?                                 |  |
| Transparency  |  |
| Regulatory fees (tariff approval, licensing)                      |  |
| Cost-based tariffs allowed (two-tier, cost-plus)                  |  |
| Possibility to include investments in tariff                      |  |
| Efficiency and service quality benchmarking                       |  |

A scorecard is not a new concept, but would provide a new, agreed-upon set of metrics and an approach for updating the metrics. This would enable investors and donor agencies to more transparently coordinate district heating sector activities with one another and with recipient countries, and it would enable recipient countries to more clearly understand the actions needed for their chosen heating strategy to meet international acceptance. The idea is to reduce search cost, and increase agreement and transparency. One alternative is to have a third party, public interest or research organization take on the task of monitoring /update the scorecard, with an annual meeting of the major organization meet annually to review progress and coordinate actions.

## Impact of Past Donor Programs

After the Soviet Union fell apart, the countries of the Warsaw Pact went through a major economic transformation, which in some countries lead to traumatic economic shock. The role of the international assistance in the economic transition process cannot be overestimated. Undoubtedly, in their transition process the countries of the region immensely benefited from technical assistance supporting economic and legal reform, formation and acceleration of civil, financial and market institutions, promotion of democracy, anti-corruption and protection human rights, rehabilitating infrastructures and promoting market-based and cost-effective business practices, application of advanced and environmentally friendly technologies, etc.

The heat sector in planned economies was managed by the government and by the time the planned economic formation was abolished, the heat sector was in a state of major technical and economic decay. After the stabilization following the initial crisis, and with the help of international technical assistance, the country governments realized that the only way to attract investments into this declining sector was through fundamental changes in policy, regulation, management and operation of the heat sector, along with the rest of the public utilities.

International aid agencies and financiers have played a major role through promoting policy reform with the integration of incentive-based market mechanisms, cost-effectiveness, environmental consciousness, and private sector participation.

The key problems identified in the region were solved successfully in some countries. The impact of donor assistance can be most vividly observed in the CEE countries which already are considered to be in the graduation phase of transition. The heat sector reform process promoted by development agencies and IFIs included a step-by-step (i) legal reform, (ii) tariff and regulatory reform and (iii) commercialization. While more smoothly carried out in the electricity sector, heat sector as well had to go through the same process.

The technical assistance programs and the reform were aimed at creating the right market conditions for improving the economic performance of the heat sector including, and the components that worked most effectively included the following:

- ✎ improving general utility accounting and audit practices for conducting effective business and gaining investor confidence;
- ✎ unbundling tariff and setting cost-recovery, consumption-based tariffs, combined with introduction of metering and control aimed at raising collections;
- ✎ gradually eliminating subsidies and switching to addressed social assistance schemes, opening up the heat sector for private sector participation and promoting public-private partnerships;
- ✎ helping improve the country investment climate through banking sector reforms and working with the borrowers to help build credit-worthiness and design bankable investment projects;
- ✎ helping design technical norms and efficiency standards to accelerate the market for energy efficiency investments;



- ✍ designing and implementing hundreds of pilot projects with invaluable lessons learned and replicable institutional, technical and financial models of restructuring and improving efficiency of heat and hot water supply;
- ✍ developing financing mechanisms for heating modernization projects and sharing investment risk in heat sector through credit guarantees;
- ✍ raising public awareness about the costs and benefits of various heating options, commercialization of the utility service, tariff structure, potential savings, consumer rights and responsibilities, etc;
- ✍ strengthening the capacity of national and local government, utilities and housing associations for effectively carrying out their respective roles in the reforming heating sector;
- ✍ helping enhance energy security and environmental conservation through fuel conservation, combined generation, effective decentralization, and fuel switching;
- ✍ developing targeted reports and case studies to evaluate the feasibility of different legal, institutional arrangements and investment projects; and
- ✍ leveraging additional credit and grant financing from host-country governments, other IFIs, local banks, vendors, private entities, and public funds.

The international donor programs were quite successful in introducing privatization of energy assets, establishing and training independent energy regulators, providing technical assistance in development of laws, raising public awareness, producing sectoral assessment reports, feasibility studies and offering credit mechanisms. Some of the most successful programs include:

- the USAID programs aimed at establishing and strengthening independent utility regulatory commissions,
- WB, EU (through TACIS and PHARE in new EU member states) and UNDP/GEF projects supporting metering,
- UNDP/GEF projects aimed at eliminating barriers for efficient municipal heat supply and rehabilitating DH systems for energy conservation and climate change mitigation (e.g. Armenia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Russia, Slovenia, Turkmenistan, Uzbekistan),
- USAID and WB programs helping national governments develop national heat strategies (e.g. USAID in Moldova, WB in Armenia),
- USAID Development Credit Authority (DCA) credit guarantee instruments mitigating the risk of lending in energy efficiency projects through bank lending, municipal bonds, etc.
- WB support in strengthening the capacity of home-owner associations / condominiums (e.g. Condominium advisory center in Lithuania),
- EU and GEF environmental programs directed at reduction of GHG emissions from heat sector ( e.g. use of environmental funds for DH modernization under EU debt-for-environment swap in Poland),
- WB/IMF and EBRD soft loans for DH modernization (e.g. Bulgaria, Poland, Moldova and many others)

Less has been achieved and continued donor assistance is necessary in other areas such as training municipal and national officials, as well as DH company managers in better planning and management, encouraging use of local fuels and boosting energy security, updating the construction norms and energy efficiency standards, promoting local production of efficient equipment, integration of energy issues into local sustainable development agenda, integration of residential energy efficiency and social safety mechanisms for better affordability of utility services, as well as utilizing the knowledge of local and regional experts in restructuring programs. With continued help from donor agencies, the national governments should continue the urban heating reform aimed at creation

of attractive investment climate for more private sector participation and investment in energy utilities and services.

## Future Directions: Summary of Recommendations

The share of the market served by district heat is much higher in transition economies than in the countries of Western Europe. This is one of the legacies of central planning and many argue that energy efficiency, economic, and environmental advantages of district heat should be preserved. Many of the systems are in dire need of upgrade or replacement, and that preserving the systems may involve a higher cost than that of improved energy security, which begets the question of who should pay the higher cost and how much.

The bottom line is that policy makers have the onus for taking actions to implement the country specific strategy that affects the ability of business interests to engage in ventures that provide the intended policy outcome. Both need to work together and with donor organizations to develop timely solutions that meet their mutual needs.

Lithuania and Poland each provide reasonable examples of policy frameworks for improving district heating systems in the region. Poland has achieved both investment and relatively low prices, and Lithuania is now marshalling investments to combat high price levels. Bulgaria and other nations have made good progress recently. Romania continues to make progress but has difficult transition problems to solve in terms of ownership, management and tariff regulation.

Poland, Hungary, Czech Republic, Bulgaria, Romania have all gone a long way on the reform path, and while there are still objectives to be accomplished, the host countries do have the capacity and institutions to pursue the needed reform independently, and they have the financial capacity to incur the costs required. The EU Directives provide the general legal framework and political priority for the CHP, building energy performance requirements, while the European emissions trading system catalyzes the market for emission abatements. The EU accession and structural funds are also providing tremendous support in enforcing these ambitious reforms, considering that the rest of the international development agencies have completed their key assistance programs in those countries, and the IFI continue mainly lending activities, with little to no grant assistance available.

On the other hand, the rest of the transition economies, particularly those that are not entering EU, are still in the early phases of reforming their heat sectors. While the energy sector reform has well progressed in the region, the heat sector reform has lagged significantly. The general economic and political instability of the countries, the social welfare of their citizens, and generally more aggravating starting conditions than their Western brothers, have resulted in unforgivable slow reform process. As a result, district heat sector remains a difficult sector in constant need of investments, frequent accidents, outdated, inefficient technology and poor service quality.

In some countries the valuable heating assets inherited from the Soviet era fully depreciated, service quality kept worsening, instead of rising, collections started dropping, market competition started offering more attractive, decentralized heating options, and the heat sector started losing customers before it managed to recover efficiency and commercialize service provision (in Moldova, Armenia, Georgia, Azerbaijan).

The largest nations, Russia and particularly Ukraine, have started making some progress in heat sector reform. While still far behind their Central European neighbors, they have made ambitious legislative attempts in the sector. In the most recent years Ukraine adopted Heat and CHP Laws, and a National Heat Strategy. The growing fuel prices and the burden on municipal budgets have motivated some visible system modernization efforts. Nevertheless, the modernization and implementation of reform should be further promoted to minimize supply costs, promote efficiency and provide these large nations' population with affordable heat.

Based on an in-depth review of heat sector restructuring and reform efforts in twelve countries, as well as an analysis of the experiences with and results generated by this reform in the region, several key recommendations can be articulated for national governments and international financial institutions involved in heat sector reform. Some countries began heat sector reform early, mainly due to the availability of technical assistance from international organizations and the political will to embrace reform. Others have only recently embarked on the path to reform and can benefit greatly from the lessons learned in countries more advanced with reform.

It is important to stress that there is no single reform model that fits and can be adopted by all. Heat sector reform is a multi-component process and it is critical to steer the path to reform along a sequence of milestones in order to avoid pushing the sector in the wrong direction. A heat sector policy needs to encompass all aspects of the heating chain in its entirety, including private sector participation, financing mechanisms for investment, efficiency on both the supply and demand sides, metering and billing, energy planning at the local level, heat assistance schemes, and effective contractual arrangements for heat supply service. The main policy instruments that have performed successfully in the region are summarized below by intervention areas, relevant actors and specific policy and program recommendations that proved effective in countries of the region.

### ***Area 1: Local energy planning and competition***

**Problem Addressed:** Failure to integrate the heat sector into the local development agenda and unfair competition between various heating options resulting in suboptimal allocation of heating options from efficiency, environmental, social, safety standpoint.

**Actors:** Municipalities and local government, along with technical, methodological support from line ministries

#### ***Policies and Programs:***

- Ensure availability of full-time energy managers in municipalities for technical support and oversight in municipal energy management and municipal DH companies' operations.
- Develop municipal plans that compare and evaluate all possible heat supply options, potential fuel sources (including renewable energy), generation costs and energy efficiency.
- Zoning that allocates various heating options to the areas of coverage in a way that utilizes the least cost supply option and achieves the most affordable tariffs, the best return on investments, and the most environmentally friendly performance and demand-driven service, based on heat load density. Plan infrastructure and generation facilities based on their costs and benefits, as well as locally available fuels, renewable energy resources and surplus heat (CHP, waste incineration, industrial heat/steam). For example, a municipal energy plan might suggest DH as a heating option for densely residential populated areas; CHP-DH in suitable areas where industrial heat loads are present; local HOBs for segregated small neighborhoods; and direct natural gas for less densely populated areas.
- Evaluate future heat demand and necessary investments to accommodate the additional supply.
- Incorporate heating options in to urban planning, requiring that new residential buildings or existing public buildings connect to the recommended heating option available in the area.
- Coordinate local heat planning with related regional territorial and sectoral development policies and plans (such as infrastructure and urban and rural housing policies).
- Declare certain heating options a priority over others in appropriate localities or zones and create investment conditions to develop them as a temporary support mechanism while market distortions are eliminated to allow fair competition.
- Attribute generation costs to every heat source to enable purchase of least-cost heat first by heat networking companies.
- Include full life-cycle costs analysis with sensitivity tests for potential energy price fluctuations.

- Introduce differentiation of connection charges based on heat load densities and availability of reserve capacity.

*Sites where practiced successfully: Estonia, Latvia, Lithuania*

## **Area 2:      *Healthy Regulatory Framework***

**Problem Addressed:** Underinvestment and tariff subsidies

**Actors:** Utility Regulatory Commissions and Line Ministries (Social, Economic, Housing, Territorial, Energy)

**Policies and Programs:**

- Develop market-based pricing policies that allow full cost recovery and send efficiency and conservation signals, instead of performing social policy.
- Eliminate subsidies and cross-subsidies that impede fair competition between centralized heating and individual gas heating.
- Internalize environmental externality costs into the heat-supply cost calculation to ensure that the least-cost heat supply choice adheres to national (or local) environmental requirements.
- Ensure that national environmental and competition laws and regulations adequately address district heating companies.
- Establish national tariff methodology that reflects local economic conditions, costs, and purchasing power.
- Establish a legal/regulatory framework including the institutional capacity that fosters investment in sustainable heat systems and reliable customer service. Consider authorizing the national energy regulator to establish the tariff methodology with price setting at the local level and dispute mediation at the national level.
- Ensure that economic efficiencies from CHP are shared fairly between DH and electric tariffs to avoid subsidizing one CHP product at the expense of a high sales price on the other – this requires coordinated regulation for electricity and heat supply.
- Evaluate real, not “normative”, heat losses and include them in tariffs.
- The regulatory entity should advocate the establishment of a social safety net to address the tariff impacts. Priority responsibility should be assumed by the government; use of the tariff mechanism should be considered a temporary transition approach.
- Ensure better monitoring of local heating markets to enable proper analysis and policymaking.
- Introduce seasonal heat prices.
- Develop legal framework for applying sanctions against non-payment.

*Sites where practiced successfully: Hungary, Czech Republic*

## **Area 3:      *Market Rules and Legal Framework***

**Problem Addressed:** Lack of focus on the heat sector in the national energy policy agenda

**Actors:** Regulators, Energy ministries, with donor technical assistance

**Policies and Programs:**

- Ensure successful opening of the heating sector for private sector participation: the experience shows that leasing, concessions, partial privatization and other PSP schemes can support local authorities in DH sector restructuring and DH systems modernization.
- Provide incentives for CHP and DH enterprises by prioritizing heating options based on economic, strategic, environmental, and fuel availability criteria, as well as energy security considerations of the sovereign governments.
- The adoption of heat sector and privatization laws announces the stance of the state on the heat sector, thus helps building investor confidence. In addition, the favorable investment climate and

general long-term political and economic stability is of essence for foreign and domestic investors; and will stimulate private participation.

- Launch “profit-from-savings” mechanisms to generate a revenue stream that repays DH rehabilitation and modernization investments once affordability limits are approached or exceeded, and once further heat tariff increases will result in declining collection rates or quality of service.
- Make the district heating sector attractive for both private sector and municipal companies by providing more operational flexibility and stable market rules to DH companies—regardless of their form of ownership—in order to improve the market environment, make market rules transparent and stable, and changes predictable.
- Ensure better monitoring of local heating markets to allow for proper analysis and policymaking.

*Sites where practiced successfully: CEE countries*

#### **Area 4: Energy Efficiency**

**Problem Addressed:** Unsatisfactory technical performance; Lack of affordability in light of increasing heat tariffs to cost-recovery levels

**Actors:** Line Ministries (Energy, Spatial, Urban Planning), Regulators, Heating enterprises, with donor technical assistance

##### ***Policies and Programs:***

Without supplying heat at the lowest possible cost, heat supply will perpetually remain sub-optimal: to compensate for high costs apartments will be under-heated, the heating season will shortened, and frequent accidents will occur, all resulting in lower collection rates that trap heating companies in a vicious cycle. This effect could be even further aggravated by low quality of heat supply, which is a common issue in some of the CIS countries (Russia, Ukraine) due to low efficiency of generating systems and high network losses. The higher losses and fuel waste, in turn, create the need for a higher heat tariff.

While there is an incentive for efficiency in private, profit-oriented businesses, in other cases policy interventions can promote efficiency of heat supply and end use. These include energy efficiency standards for heat generation equipment and heating networks, certification and labeling programs, building energy codes, regulatory requirements on metering and customer relations prescribed in the supplier’s license, debt amnesties for installing metering devices, training for local personnel (particularly in small towns) and government support for investments in low-income households.

To encompass all aspects of the heating chain in its entirety, combined with other efforts promoting private sector participation, financing mechanisms for investment, energy planning at the local level, heat assistance schemes, and effective contractual arrangements for heat supply service, the following efficiency improvements are necessary:

- *Low-cost short-term measures:* Mandate installation of metering and control devices (e.g., Bulgaria and Romania); Establish incentive programs, funds, and information campaigns to promote weatherization of buildings, and balancing heating networks to ensure low energy intensive and high quality service). These can be achieved through building energy codes, regulatory requirements on metering and customer relations prescribed in the supplier’s license, debt amnesties for installing metering devices, and government support for investments in low-income households.
- *Medium-cost, mid-term measures:* Supply-side efficiency measures for improved cost-efficiency and competitiveness of centralized heat supply, including more expensive measures such as replacement of the oldest and most damaged networks parts, elimination of network leakages, and renovation of substations.
- *Cost-intensive, long-term measures,* such as replacing all networks with pre-insulated pipes,

modernizing generation plants, introducing more CHP, and expanding the network to connect new customers.

*Sites where practiced successfully: Macedonia, Poland, Bulgaria, Czech Republic, Baltic States*

## **Area 5:      *Financing mechanisms***

**Problem Addressed:** Lack of Financing

**Actors:** National Government, Donors and IFIs, in conjunction with local banks

**Policies and Programs:**

- Conduct targeted market studies to identify and eliminate market failures (e.g. subsidies, low collections, poor management, uncertainty, etc) that hamper commercial financing for the heating sector.
- Promote financing mechanisms—such as loans and credit guarantees—that ensure sufficient rates of return on investments in energy efficiency and modernization improvements to heating enterprises, and that promote the establishment of centralized heat supply in areas where such services can be cost-effective.
- Accelerate the influx of banking capital to the heat sector by providing technical assistance to borrowers for heat modernization.
- Attract loans from international financial institutions with careful consideration of terms and conditions.

*Sites where practiced successfully: Bulgaria, Romania, Latvia*

## **Area 6:      *Service Quality and Customer Orientation***

**Problem Addressed:** Lack of Consumer Focus

**Actors:** Regulators, heating companies, line ministries, home-owner associations and NGOs, with capacity building from donor programs

**Policies and Programs:**

- Switch to consumption-based billing based on metered heat, where possible, and to more accurate consumption norms for consumers not equipped with meters.
- Avoiding a blind “metering everything and everywhere” policy and instead tune metering programs to selected heat market models and institutional form of market agents;
- Update and enforce building energy codes, and encourage energy audits.
- Strengthen the associations of home-owners to play a bigger role in the organization of transparent billing, DMS measures, fee collections, building energy efficiency, etc.
- Eliminate legal gaps limiting borrowing by condominium associations to promote building thermal rehabilitation.
- Integrate reliability, efficiency and quality of service indicators (standards) into heat supply requirements.
- Ensure regular communication with consumers to improve payment discipline and cash collection. The assistance to very low-income households should be a national or local government prerogative (see next section on Social Safety).
- Provide information on end-use energy efficiency – how they help (economic benefits), what measures should be considered, how to find them.

*Sites where practiced successfully: CEE and Baltic States*



## **Area 7: Social Safety**

**Problem Addressed:** Lack of targeted social assistance; affordability concerns used as a reason to avoid increasing tariffs to cost-recovery levels

**Actors:** Regulators, local governments, community councils, Social and Energy, Ministries, with donor technical assistance

### ***Policies and Programs:***

- Carefully evaluate affordability limits when setting pricing policies and eliminating cross-subsidies. Shift from control of heat tariffs alone to also take into account the customers' purchasing power (ability to pay). The more efficient the heating, the greater the ability of low-income households to pay for it. Basic economic logic dictates that high price for any product or service reduces the demand for it, and any high tariff or tax rate in society increases the number of free-riders.<sup>40</sup> Similarly, in the district heat market, increasing heat tariffs should theoretically raise the supplier's revenues, but if the tariffs cross the affordability threshold of the consumers, the household collection rates suffer.
- Develop energy efficiency programs for low-income households aimed at reducing their consumption, instead of the traditional allowances to cover their energy bills.
- Combine elimination of subsidies with supply-side efficiency improvements and provide targeted assistance for the purchase of end-use metering, HCAs, and TRVs, becoming a driver for even more tariff growth if the heat supply company's costs are not reduced, further aggravating affordability issues.

**Sites where practiced successfully:** Hungary, Poland, Bulgaria

## **Area 8: Training, Capacity Building and Awareness**

**Problem Addressed:** Lack of local expertise and awareness

**Actors:** Donors and IFIs

### ***Policies and Programs:***

- Address the extensive need for capacity building on heat sector issues in countries with transitional economies by providing assistance at all levels and for all relevant target groups: state and municipal authorities, energy consultants, management and technical personnel of the heat providers, the banking sector and other targeted financiers, as well as the consumers and HOAs. Capacity building should cover the range of topics affecting the heat sector, such as state-of-the-art technologies, successful institutional models, commercial business practices, municipal energy planning, municipal heat master planning, customer relations, preparation of energy efficiency and borrowing proposals and ESCO contracting by HOAs
- Optimize and maintain employment provided by the DH systems by eliminating unnecessary bureaucracy and recruiting new accounting, customer relations personnel and western-style managers.
- Develop information instruments that effectively and succinctly communicate to all levels, including for example: [1] guidelines or manuals for managers and personnel on how to improve reliability and effectiveness of heat supply, not only on the effectiveness of heat sources and networks but stressing the importance of the effective heat use of heat in customer installations; [2] guidelines on upgrading and modernizing substations and end-use installations in customer's buildings; [3] guidelines on co-operation between heat producer and distributor, heat distributor and customer; [4] development of PSP contracts; and [5] developing of effective heat pricing regulations that would guarantee efficient, economically viable and affordable heat supply service.

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<sup>40</sup> In a simplified interpretation, the theory behind the "Laffer curve" states that higher tax rates has a "penalizing" economic impact on the tax-payers, creating an incentive to avoid taxable activities. A quick summary on the topic can be found, for example, at: <http://www.heritage.org/Research/Taxes/bg1765es.cfm>

- Support the organization and co-operation of residents through Home Owner Associations or similar arrangements. This is a prerequisite to any successful heating sector development.
- Cultivate public-private partnerships with municipalities to facilitate the elimination of institutional barriers while attracting private capital. For example, service and management contracts can be used to upgrade the operational efficiency of the system, and also boost the value of assets if privatization is being considered. Provide HOA training in contracting with DH companies, billing and collections among HOA apartment owners, preparing and implementing energy efficiency projects, and ESCO contracting.
- Utilize the experience of suitable demonstration projects to inform government policies on the choice of institutional and regulatory reforms.

*Sites where practiced successfully: Bulgaria, Latvia, Lithuania, Armenia, etc.*

## ***Area 9: Environmental Considerations***

***Problem Addressed:*** Weak environmental regulations

***Actors:*** Environmental Ministries, Designated National Authorities, Donors

***Policies and Programs:***

- Local emission standards
- Energy carrier or carbon taxes
- Use of environmental funds for fuel switch and cogeneration projects
- Carbon financing and capacity building on methodologies for project financing in heat sector under the UNFCCC flexibility mechanisms, including Joint Implementation and Clean Development Mechanism
- Smooth and transparent procedure for carbon project approval

*Sites where practiced successfully: Poland, Romania, Bulgaria, starting in Ukraine, Armenia*

# Regional Urban Heating Policy Assessment Part III: ANNEXES

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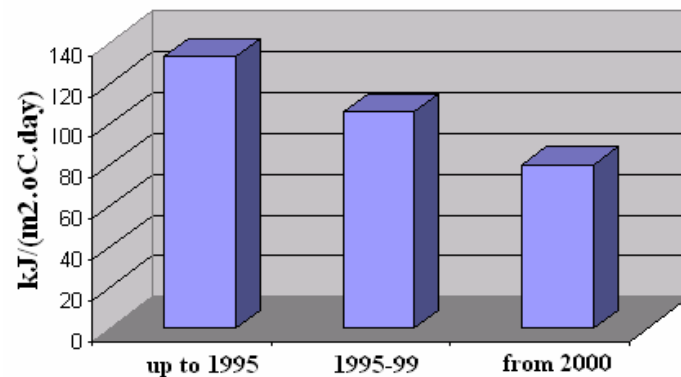
## ANNEX I. CURRENT STATUS OF URBAN HEATING IN SELECTED COUNTRIES: SUMMARY OVERVIEW

### Russia

Russia is home to one-third of all district heating customers in the transition economies. Russian efforts to de-monopolize and rationalize its energy sector have generally been attempted at the national level, with leadership for financing, standards, and public education originating from the regions.

The increasingly strict residential building codes for Russia are shown in **Figure A1**, but under Russia law building codes and standards are provided at the national level only as a model for acceptance or rejection by the local governments. Since the adoption of new Federal building energy code in 2003, 48 of 88 Russian regions have already adapted them into local-territorial construction norms, as shown in **Figure A2**. It is noteworthy that these construction norms (building codes) are mandatory for seven years from the day of their adoption, and become only recommendations afterwards. Since 2004, within the framework of *CIS Interstate Scientific-Technical Commission on Standardization, Technical Norms and Certification in Construction*, Russia, Kazakhstan, Armenia, Tajikistan, Kyrgyzstan, Moldova, and Uzbekistan have started the process of developing "Interstate Building Code" on the basis of the Russian building energy code, an important beginning for building code modernization in these countries. Ukraine and Kazakhstan have officially pursued adoption of the "Interstate Building Code" on a national level.

**Russia: Reduction of net heat energy consumption norm for 6-9 floor residential buildings by years**



Source: CENEF

**Figure A1. Evolution of Russian building**

Russia's success in updating district heating systems has also been impeded by complicated building ownership structures that frustrate investment efforts. It is exceedingly difficult to answer the question, "Who is the customer?" It cannot be the individual flat owner who controls investment in demand, because s/he does not control the building. But the building manager does not pay the bills, and so does not have an incentive either. This problem of split incentive is well known in the west and can be overcome through the creation of housing cooperatives and condominium associations, but programs to organize this effort have been weakly supported by regional and national authorities, even when funded by outside organizations such as USAID, the United Nations Development Program and the World



**Figure A2. Regions of Russia with new building codes (green). Regions in yellow have draft codes pending approval. Source: CENEF**

Bank. This problem of split incentive is well known in the west and can be overcome through the creation of housing cooperatives and condominium associations, but programs to organize this effort have been weakly supported by regional and national authorities, even when funded by outside organizations such as USAID, the United Nations Development Program and the World

Bank. District energy reform in Russia usually becomes a political tool in election years, and energy supply is state-controlled, making it subject to use as a tool of the state to reward supporters or simply to implement social policy. This is particularly true with Gazprom, the Russian monopoly gas supplier.

The Russian heating sector is regularly ignored when national energy policies are discussed, in spite of its titanic role in the Russian economy, as summarized in the **Box A1**. This is the case in spite of the fact that energy saved equals energy generated and that federal, regional, and municipal authorities struggle every year to ensure an adequate and reliable supply of heat during the cold season. About US\$ 3 billion are spent for this purpose annually, with another US\$ 3 billion spent every year to address numerous heat-related emergencies. In 2005, heat tariff growth was accused of being a driving force for country-wide inflation.

#### **Box A1. Quick Facts on the Russian Heating Sector**

- ↳ Accounts for about 45% of all domestic energy consumption.
- ↳ Responsible for about 50% of fossil fuel use.
- ↳ Public DH consumption uses 7% of State Budget.
- ↳ The largest single product market in Russia split into more than 50,000 local markets.
- ↳ US\$ 36 billion in annual sales.
- ↳ US\$ 10 billion potential annual savings available with US\$ 50 billion efficiency improvement investments. Presently, only US\$ 500 million are invested annually for this purpose (a rate at which 100 years would be required to utilize the cost reduction potential).

Any country-wide averages or statistical aggregates for Russia must take into consideration the amazing diversity of heat supply system in Russia. The heat supply season in Russian cities varies greatly, from 3,000 to 12,000 degree-days. Overall DH system efficiency varies from a Helsinki-like level to as low as 25%; heat tariffs range widely from 4 to 250 US\$/Gcal; some systems are dominated by industrial consumers, while residential dominates others; systems range from completely centralized to completely decentralized, and from completely municipal to wholly private-owned.

The Russian district heating system is the largest in the world, encompassing 485 CHPs, over 190,000 large boilers, 22,000 central heating points, and 183,000 km of heat pipes. Its heat sources annually generate about 2,300 million Gcal. Boilers dominate heat generation, with CHP accounting for 30%.

The average fuel efficiency of district heat generation is 71%, and heat transportation and distribution losses are over 20%. Heat supply to residential and public buildings is responsible for about 75% of all heat losses. Buildings account for almost half of all heat end-use, using more than the industrial sector, the second largest heat consumer.

In spite of their diversity, DH systems all over the country generally face a fairly universal set of problems:

- substantial excessive supply capacity;
- excessive estimates of consumer heat loads;
- excessive centralization of DH systems;
- low density of heat loads and correspondingly high levels of distribution losses;
- lack of regulatory parameters towards characteristics of heat as a product;
- the absence of effective cost allocation procedures;
- low collection rates and inadequate tariffs resulting in lack of revenues for proper maintenance;
- misleading indicators to inform investment decisions on the rehabilitation of DH systems;
- insufficient use of reliability criteria in assessing DH system operational performance;

- lack of incentives to improve efficiency; and
- shortage of qualified personnel, especially in small-size heat supply systems in small towns.

The controversy of centralization versus decentralization is a major factor driving the future for CHP in Russia. Unlike many other countries that support CHPs, the present and future outlook for CHPs in Russia is gloomy. There is no specific policy to promote CHP through power sector reform. Demand for heat generated by CHP in power utilities is gripped in a competition vice between declining demand (due to energy efficiency and competition from other energy carriers) and growing alternative heat supply by autonomous boilers and small modern industrial and municipal CHPs. This combination of factors triggered a cost escalation that is affecting both heat and power generation costs.

There is a mosaic of different institutional models and settings in Russian district heating markets across the country. The share of the private sector in DH ranges from 100% to none, and declines as one goes along the heat supply chain from generation to distribution. Municipalities predominantly own DH facilities, and are increasingly leasing them to private operators. In some cases they transferred ownership of some parts of the DH system to private companies. Sometimes municipal DH facilities are sold to cover debts for heat provided by public power utilities. The part of the Russian business community that has moved to DH employs two different strategies to penetrate the heat market. The first one can be described as “wide regional coverage first – learning by doing next”. The alternative strategy, employed by the “Novogor” company and some others, is to “learn by doing first – scale up activities next”. The second strategy appears to be more effective, but there is insufficient evidence at this point that private companies are any more efficient operators of DH systems than municipal ones.

The whole DH system is not well institutionalized to motivate heat costs reduction and end-use efficiency improvement. There are no bad habits, but there are bad incentives and bad market structures! In Russia, those who are capable of improving energy efficiency often have no wish to do so, and those wishing to do so lack the ability. Motivation is a key to the adoption of best practices by the district heating and building sectors.

The institutional organization of end-users in the housing sector is one of the most serious problems. It is not quite clear what exact market product is for sale (a comfort or a resource) or how the customer is defined. A relatively simple market transformation is needed to replace the existing situation with one where heat comfort is the commodity for sale. It requires introducing agents to the market who can perform ECSO functions—that is, to buy energy as a resource and turn it into comfort to be sold to residents. This scheme requires a support system of metering and billing: current systems need to be supplemented with building level heat meters, or better yet individual heating points, which would allow not only for metering but also for regulation. An alternative system, individual household consumers, creates problems relating to heat billing in multi-family buildings which are designed for a collective consumer. While many experts aggressively support the transition to flat-level heat meters (allocators), this is not a cost-effective solution.

Heat metering programs must be tailored to the desired institutional market scheme so that a transition can be made, where necessary, to consumption-based billing and metered heat for comfort service, to more accurate consumption norms for consumers who are not equipped with meters. Calculations show that for Russian buildings with heat loads below 0.2 Gcal/hour, the consumption is so small, that savings from efficiency measures will be less than the costs of meters and their service and maintenance. In such cases, there is a potential trap: high tariffs encourage the installation of meters and heat consumption controls, which – if the heat supply company’s costs are not reduced – becomes a driver for further tariff growth. Importantly, heat consumer’s behavior is not well known.

Heat costs and tariffs in Russia vary widely across the country: from 4 to 250 US\$/Gcal. The prices for heat provided by regional power utility companies is set by the Federal Tariff Service, a government agency. Heat prices are set for two coming years in the form of minimal and maximum



caps. That provides some predictability of heat price evolution. The final price level is established by the Regional Energy Commissions (RECs). These commissions also set prices for heat generated by industrial CHPs and boilers. As a rule, municipalities are no longer responsible for setting heat prices. The heat tariff setting system was supplemented at the end of 2005 with heat tariffs growth caps set for each region by the Federal Tariff Service in order to control country-level inflation.

According to the new regulation enacted in 2004, heat generation and transportation costs are unbundled, and heat suppliers are eligible for the investment component of the price to partly finance investment programs coordinated with municipality. However, heat pricing is still held hostage to ineffective heat cost allocation rules and poor knowledge of the price sensitivity of both producers and consumers. Heat prices are set without regard for the remoteness and size of customer or seasonal flexibility. The heat tariff menu is poorly populated, so both suppliers and consumers lack tariff flexibility.

After heat subsidies were basically eliminated from 2004 to 2006 (with some exceptions), urban residential consumers pay 20 to 50 US\$/Gcal. Prices for residential heating and hot water vary widely throughout the country, mirroring not only differences in costs for supplying heat, but also different levels of consumption of space heating and district heat water (DHW). Space heating and DHW are presently responsible for about 40% to 75% of overall housing and municipal utility costs. The escalation of heat prices, therefore, is an important driving force pushing housing and municipal utility costs beyond the ability of low-income households to pay, and therefore pushing down collection rates.

Heat pricing policy is locked into the narrow range of affordability thresholds and high production costs supplemented with a need to finance modernization programs. The key for loosening this lock is reducing heating costs by optimizing the DH system structure and improving its energy efficiency. This should be done in consideration of the growing gas prices planned for Russia's domestic gas consumers (See **Box A2**).

Poor municipalities are able to supply at best half of the heat needed by consumers, meaning that their indoor comfort is far below what it should be. To cope with the shortage, municipalities reduce the duration of the heating season and/or the heat temperature. Yes these low quality services are often billed as if normal heat supply services were being provided. Obviously, this leads to low payment discipline, making the municipal heat sector less attractive for investors and reducing the extent to which normal market considerations are relevant to management of this sector.

Lack of attention to the heating sector by the federal government is a barrier to further reform. The responsibility for providing reliable heat services to consumers was delegated to municipalities, with no federal agency responsible for promoting heating sector reform through government policies or the legislature. If reform continues at its current slow pace, the private sector may lose interest in the heating sector, allowing it to degrade further.

**Box A2. Russia's domestic gas prices to reach European level by 2015**

In October 2006, the Russian Industry and Energy Minister Viktor Khristenko announced that the domestic gas prices in Russia will meet the European level by 2015. "We should increase domestic gas prices to the European level, excluding transportation and logistic costs, by 2015. Therefore, domestic gas prices will be about 30-40% less than gas prices in Germany," he said. A fair gas price on the Russian domestic market should make \$140-160 per 1,000 cubic meters, Khristenko said.

*Source: 20.10.2006, MOSCOW, Itar-Tass*

The need for change in the Russian district heating sector remains strong. While there is definite progress in reforming the heat supply sector in Russia, progress is often too slow and reforms sometimes push the sector in the wrong direction.

## Armenia

Armenia's district heating (DH) systems were forced into lingering idleness after the collapse of the Soviet Union due to the fuel supply disruptions. When fuel supply was recovered, the DH systems have already deteriorated and became inoperable. Instead, the majority of apartments in urban residential buildings are heated by individual, apartment-level natural gas and/or electric heaters, and recently less wood for space heating (predominantly in rural areas). After adoption of Urban Heating Strategy and several promotional policy and regulatory provisions, unbundling of the large heating systems slowly started, followed by the establishment of several smaller, decentralized heating islands, as a more competitive alternative.

A number of stimuli created for the development of small-scale centralized heating included (i) the R2E2 Fund was established<sup>41</sup> and provides (through financial institutions) loans for efficient heating projects; (ii) the municipalities opened heating assets (boiler houses, distribution points) for privatization, concession and lease<sup>42</sup> to HOAs and ESCOs with a small/symbolic fees for heating purposes; (iii) regulation was eliminated for the small heat supply systems (< 5.8MW) with neither licensing, nor tariff approval necessary;<sup>43</sup> (iv) numerous donor-funded heating pilot projects were implemented with grants and soft loans to illustrate all advantages and drawbacks of various technical and organizational solutions.

Nevertheless, the development/rehabilitation of centralized heating (DH and small-scale centralized heating for a several buildings) did not get to a good start due to a number of remaining barriers:

- the centralized heat supply of existing or new buildings is not mandatory according to building codes, there is lack of state initiative and mandate for retrofitting and preserving the DH assets in places where they can still serve for heating purposes;
- the available loan interest rates are prohibitive for building-level heating projects if borrowed by HOAs and ESCOs;
- low ability of residents to pay coupled with the subsidized, low gas price<sup>44</sup> and intensive gasification promote the use of apartment-level gas heating as the simplest, cheapest, non capital-intensive option;
- HOAs have weak institutional and financial capacity for heating project development and heat supply system operation, moreover, their legal status and absence of assets in common ownership available for collateral, necessary for borrowing;
- the heating private sector is not well developed yet, the ESCOs have inadequate level of proficiency to supply high quality heat and poor business management experience to manage heat supply service on commercial basis; moreover, the ESCOs avoid the involvement in heating projects under ESCO-financing scheme due to minuscule desire to undertake financial risk;
- there are remaining legal gaps for ensuring safe commercialization of heating service with due contractual arrangements between heat suppliers and consumers.

As for district heating, under a Government Decree two large districts in Yerevan were opened for rehabilitation of district heating systems with application of CHPs. The CHP/DH will be subsidized through a guaranteed electricity purchase at the highest grid feed-in tariff, which would allow

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<sup>41</sup> Renewable Resources and Energy Efficiency Fund (R2E2 Fund) – donor assisted fund established by the Government of Armenia.

<sup>42</sup> All the potentially attractive DH system assets have been privatized to be used for other commercial purposes in the initial privatization process, and the remaining assets have either been recently leased for heat supply operations, or remain as a deteriorated, depreciated and cost intensive asset on the municipal balance.

<sup>43</sup> It is according to the PSRC made amendment to the Article 23 of the Energy Law, within the framework of Government's Urban Heating Strategy.

<sup>44</sup> The gas prices have recently risen sharply (almost doubled) and will be raised again in 2009, nevertheless the retail gas price for the consumers is highly subsidized by the Government.

affordable heat tariff.<sup>45</sup> These projects are under development.

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<sup>45</sup> The UNDP/GEF Project on “Armenia - Improving the Energy Efficiency of Municipal Heating and Hot Water Supply” together with a local design institute studied the heating system restoration alternatives for Avan and Davitashen districts of Yerevan with consideration of reconstruction of a heat only boiler house to Combined Heat and Power Plant (CHP).

## Belarus

The country's DH systems operates with large mostly gas-fired CHP and HOB plants exploited by "Belenergo", the Ministry of Communal Services or other ministries, state industrial enterprises, private companies as well as individual municipalities. The gas, oil, diesel oil, coal and peat used in the energy sector are mainly imported and the country is highly dependent on imports.

The residential heat tariff is regulated by the Government and are heavily subsidized (*covers 10% of production costs*); and industrial heat tariffs are calculated by the suppliers, and even include some profit. Heat tariffs vary from city to city depending on the degree of cross-subsidy from industry and state budget entities to residential consumers. The average cross-subsidy for heat consumption is about 2.4 USD/GJ. The high and unsustainable level of cross-subsidies together with high fuel costs and fuel shortages (especially outside of the large cities) created a strong incentive at the government level to find lower cost fuels and increase the use of wood/wood waste as boiler fuel. However it is not a sustainable option from global environmental perspective. To address this problem the GEF supported (over US\$ 3.37 million) biomass energy development for heat supply by introducing environmentally friendly and viable approaches.

Furthermore, the government has developed a series of regulatory documents in the field of energy saving to create a legislative, economic, financial, organizational and technical framework for efficient use of energy resources. Reduction of the use of traditional fuels in DH systems and power plants has been part of the energy policy of the Government of Belarus since 1996, and was reiterated in the energy policy for the period of 2001-2015.

During 1996-2000, US\$ 370 million was invested in energy saving activities under the National Program on Energy Saving. The investment were mostly directed to the installation of metering devices, design of new energy saving materials and technologies, boiler rehabilitation, and replacement of old heat boilers with more efficient ones. Unfortunately, other specific legislation or regulations concerning DH and CHP are still to come.

All investments aimed at DH system modernization and energy saving implementation are financed by donor-funded programs, the innovation funds for "Belenergo" and other enterprises, the Energy Savings Fund of the EE Committee (US\$ 2 million per year for the conversion of boiler houses to local fuels by providing grants or favorable loans), as well as national and local budgets. It is worth mentioning that the World Bank loan "Social Infrastructure Retrofitting Project" started recently, will invest approximately US\$ 7 million for boiler replacement or conversion from oil and coal to gas and wood fuel (about 90 small size units) as well as make investments into the partial reconstruction of DH networks (29 networks, covering piping and temperature regulation).

### Box A3. Key Facts on the Belarus Heat Sector

- There are two large heat suppliers:  
*Concern "Belenergo"*, which owns 22 CHP plants, and 30 large (over 100 MW) HOB plants, and *The Ministry of Housing and Communal Services*, which owns 1,520 HOB plants and DH networks.
- There are about 10,000 boiler houses below 10MW heat capacity under the ownership of other Ministries, state and private industrial enterprises, and public institutions.

## **Bosnia and Herzegovina**

The energy sector in Bosnia and Herzegovina (BiH) was completely destroyed during the war. All DH companies stopped delivering products to their customers due to destruction of facilities and inability of customers to pay any energy bills. The situation led to high government subsidies for energy services in almost every city in BiH.

Besides wood and coal, BiH imports all other energy resources. In early years after the war, market prices for such energy services were unbearable for the local population. This led to even worse situation. The situation is slowly improving with the collections and service reliability. Moreover, lack of coordinated energy policy led to poor management of resources, initiative and donor funds. Governments in BiH do not functioning as one, which results in parallel energy laws and policies.

Consumers payment for energy services in recent years, jumped from almost 0% to 90%. However, government still provides subsidies in order to make these companies operational. There are very few operational DH systems in BiH, mostly in larger towns. All other DH companies stopped during the war and never recovered. All of them struggle with poor efficiency, low payment from customers, old technologies and increasing prices of oil or natural gas used as fuel. Overall, the lack of information from energy sector creates additional problems for policymakers, as well as for the companies themselves.

## Bulgaria

The trend in the final energy consumption in residential sector in Bulgaria by energy sources shows stable increase of the share of wood. The reverse trend – towards diminishing of consumption – has been noted for fuels from coal and lignite, most often briquettes, and for district heat. District heating consumption is characterized by a sharp drop after 2002, which coincides with the period of introduction of heat accounting and replacement of DH substations and the introduction of changes in the regulatory framework with respect to district heating supply. Natural gas has been penetrating the residential market as an alternative energy source since 2001; however until 2004 its share was still quite negligent although increase is observed. The process of gasification in residential sector in the biggest cities like Sofia and Varna started in 2004. Previously natural gas was offered to the population in smaller cities and the share of residential customers is still not sufficient.

District heating is one of the most common heating alternatives in the multifamily buildings in the biggest cities. Historically, all DH systems in Bulgaria were state owned and in the 1990s only the biggest DH Company in the country, “Toplofikatsiya Sofia”, producing more than 80 % of the total heat in the DH sector was restructured in 100 % Municipal company. Later due to accumulated debt to the state-owned gas supplying company “Bulgargas”, 41% of the shares became state owned. District heating sector is in a process of privatization since 2004 and process is still not completed. The first DH company with private participation was building in 2002 in the city of Stamboliyski. Later a few more small scale DH companies received licenses for heat production and distribution. Till the end of 2005 a total number of 10 out of 21 DH companies were transferred to 100 % private property. At the time of this writing, all except the Sofia DHC were privatized.

Tariff reform in DH sector continued almost a decade. In the beginning there was a unified tariff for all DH companies, which was not sufficient to cover the real production and transportation costs. On a later stage separate prices for different DH companies were introduced. Tariff increases were introduced periodically; however they did not at all lead to diminishing of the level of subsidies since the enterprises continued to make losses for a number of factors, such as lack of investments for improvement of the efficiency of the systems, poor accounting and collection practices, and disconnection of growing number of subscribers because of the price increases. In 2002 started the pricing reform focusing on the phase-out of subsidies, which practically happened in 2005, when all the prices were liberalized. After removal of subsidies only the low-income people remain receiving financial support for energy needs by the social safety net program. Since 2002 the State Energy Regulation Commission (SERC) is responsible for electricity, natural gas and district heating tariff setting and regulation.

Historically, Bulgarian households have not had their heat usage metered. The old billing system charged households solely on the basis of the number of cubic meters of apartment space. As a result of the government program initiated in 1996, block meters were installed in basements of all district heated residential. Later, the government introduced the concept of household-level metering by creating a legal requirement for households to install HCAs (for heat metering) by September 2002. All newly constructed buildings foreseen to be connected to DH are implemented with horizontal floor distribution of the building heating systems and equipped with apartment heat meters.

Comparison of the prices for the available heating options as of November 2005 shows that the most expensive modes are those involving the use of electricity (excluding heat-pumps), light oil and Propane-Butane gas. DH is competitive in prices as compared to natural gas and coal of local origin and more expensive as compared to firewood and imported coal.

The biggest projects in the DH sector for the last years are the project for rehabilitation of the heat transmission network of DHC Sofia with a budget of 114 million BGN included supply and installation of local heating substations, replacement of heat transmission network and the project for of the heat transmission network and heat source in DHC Pernik for 13.7 million USD. A project for construction of a cogeneration module in Varna DHC for 4.9 million BGN was structured and implemented in 2004. Installation of cogeneration modules are planned in other already privatized

DHCs. The investment agreements of purchasers of privatized DHCs also foresee modernization of processes for production and transmission of heat energy in the respective heating systems. Financing for the above and other DH investment project is provided by the WB, EBRD, the Kozloduy International Decommissioning Support Fund (KIDSF), the Bulgarian EE Fund (BgEEF) and local banks.

The price of district heat in Bulgaria is moderately high, and is not subsidized. Electricity appears to be a major competitor to district energy, even though its actual cost is twice as great. Refurbishment and regeneration of district energy systems in the big cities is proceeding under sovereign financing arrangements provided by the government of Bulgaria. The World Bank and the European Bank for Reconstruction and Development service this arrangement under mutually beneficial terms.



## Czech Republic

The energy sector restructuring in Czech Republic started with privatization of energy and housing assets, enforcing strict environmental regulations, gradual elimination of subsidies, liberalization of electricity and gas markets, elimination of price regulation for all energy sectors except of the district heating<sup>46</sup> (regulation based on eligible costs and maximum annual price increase).<sup>47</sup>

The large power and heat plants were separated from power utilities and transferred from state to municipal and/or private ownership in early 1990s, while the small-scale DH utilities have always been under municipal ownership. Most commonly, the municipality owns infrastructure and a private company operates the DH system. Although there is a tendency towards increasing the DH share in large urban areas in Czech Republic, decentralized energy supply proceeds rapidly, due to poor condition of DH, which still based mostly on old technologies (coal-fired).

Future growth and improvement of the Czech heating sector will require a continuing role of the public sector, including oversight, improved regulation, investment incentives, and policy reform. The Czech Energy Efficiency Act introduced requirements contributing to the improved efficiency of urban heating including: 1) building-level heat metering, 2) regulation and individual controls; 3) minimum energy efficiency standards; 4) energy audits; 5) feasibility analysis for CHP; 6) regional and municipal energy policies and planning; and 7) Czech Energy Agency – administrator of state support to energy efficiency. The bylaw, regulating requirements for heat cost allocation, resulted to about 40-60% of district heating costs payment according to actual heat consumption - heat cost allocators. However, the remaining consumers pay according to dwelling space, which does not provide effective energy-saving incentives. Heat subsidies were abolished in 1998 but the VAT rate remained at 5%. With the new Energy Act, which came in force in January 2001, the Czech Energy Regulatory Office (ERO) is in charge of pricing and licensing. The introduction of metering allowed reducing bills, which mitigated the impact of subsidy elimination.

It is also worth mentioning that the legal framework regulating the relations of the supplier and the consumer also contributes to DH strengthening. The consumer may choose to either independently conduct a heat cost allocation or outsource it. Although the legislation has introduced compulsory municipal energy planning for new regional governments and largest cities in Czech Republic, the deadlines and sanctions for non-compliance have not been defined.

Czech Republic has one of the most saturated urban heating sectors in terms of availability of financing mechanisms, including grants and loans. Aside from central and DH, the heating options in use in Czech Republic also include individual building heating (8.1%) and various apartment-level stoves (15%) using gas, electricity and solid fuels.

### Box A4. Czech Heat Sector Basic Facts

DH covers over 60% of heat demand:

- ↳ 55% is provided by HOB, and
- ↳ 45% - by CHP (with 6,000 MWe installed capacity, producing 18% of national electricity generation).

In 2003 DH supplied 4.2 Mtoe heat, consumed by:

- 44% - by households,
- 39% - by industry, and
- 17% - by commercial services.

### Dynamics of Direct Fuel Subsidies in Czech Republic

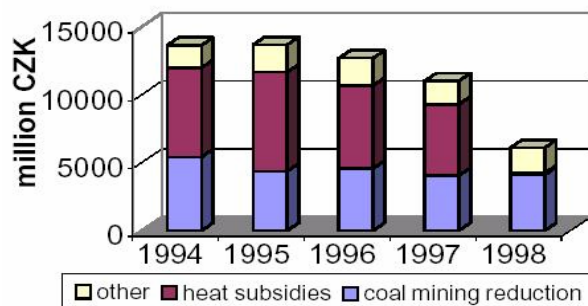


Figure A3. Gradual phase-out of heat subsidies in Czech

<sup>46</sup> Recent developments on Municipal Energy Planning in the Czech Republic, Presentation by SEVEN, o.p.s. Belgrade, December 14, 2005.

<sup>47</sup> The economist Janos Kornai would have recognized this option as one of the great causes of inefficiency in central planning.

## Croatia

In Croatia the trend in the final consumption of energy sources in the residential sector during the period 1992-2002, shows the highest growth rate for natural gas consumption, whose share has increased by nearly 8.5%. By 2002 electricity accounted for the biggest share in the residential sector with nearly 30% and the share of natural gas was 26%, mainly for space heating and hot water production. District heating during share has been dropped by a total of 2%, bringing the value down to 8.5% in 2002. Oil products also account for a large share in the national total final consumption. A significant portion of this share may be assigned to the demand of LPG, especially in the southern areas, where at present there is no adequately developed transportation network for natural gas.

Croatia has 13 district heating systems located in the most of the major cities, connecting 26% of total apartments and supplied from a mix of cogeneration (CHP) and heat-only plants. HEP-Group owns the three CHP plants (two in Zagreb and one in Osijek) and a heating plant in Sisak, and operates the heat networks in Zagreb, Osijek, Samobor, Velika Gorica, Zaprešić and Sisak under embryonic concession arrangements with the municipalities. In the rest of the country, DH systems are run by separate enterprises (either owned by a municipality or under concession from the municipality), which ensure the supply and distribution of heat only.

To 2005 no privatization of the DHC serving the systems in six cities: Zagreb, Osijek, Samobor, Zapresic, Velika Gorica and Sisak have been affected in Croatia, where they remain state owned in the framework of the HEP Group. The Hrvatska Elektroprivreda Privatization Act was passed in 2002. Under the Act, at least 51% of HEP shares will remain in government ownership up until the Republic of Croatia joins the European Union. Croatian Homeland War veterans and their families will receive, without compensation, up to 7% of the shares, and up to 7% will be sold to current and former HEP employees under special privileges. At least 15 % of the shares will be offered to Croatian nationals through a public offering with pre-emptive rights and privileges yet to be determined, while the remaining shares will be offered on the capital market depending on market circumstances. The DHCs in the other 7 cities, are municipal property, however there is no available information whether any privatization deals or sale of shares have been effected in their case.

Since 2002 Croatia has applied new laws that govern the energy sector: Energy Act, Energy Activities regulation Act, Electricity Market Act, Gas Market Act and Oil and Oil Products Market Act. A key determinant of these laws was establishment of Croatian Energy Regulatory Council, as an independent regulator of energy activities, later, in the end of 2004 replaced by the Croatian Energy Regulatory Agency (CERA). CERA regulates and controls the work of the energy sector, participates in implementing energy policy, controls development and work of energy markets. Tariffs consist of energy and compensation for services provided by energy undertakings under public service obligation, for carrying out the regulation of energy activities and for stranded costs. Prices will be based on justified costs of operation, maintenance, replacement, construction or reconstruction of facilities, environmental protection costs and reasonable rate of return on investments.

In Croatia for the HEP owned DHCs the percentage of heat end-use paid according to m2 of heated space is about 10 %, representing the heat energy sold in the city of Osijek. The customers of the municipal DHC in Rijeka are offered the opportunity to choose for themselves the method of accounting of their heat consumption and respectively the applicable tariff – on the basis of metering of consumption by the master heat meter or on the basis of the heated area. The requirement is that all the customers in a given building shall have an identical mode of accounting.

Under the current structure of ownership of DHCs in Croatia, in the framework of the state-owned HEP Group, which is also owner of the power generation, electricity and gas distribution companies, the price of heat energy is cross-subsidized from the price of electricity, which in turn is not subsidized since 2002. So in 2004 the price of DH in Zagreb is the most favorable compared to the other heating options. For the rest of the smaller companies, there is no data concerning the existence

of subsidies for the price of heat energy. The price of DH in Rijeka for example is higher compared to natural gas, coal or light oil produced heat. Among other heating options the best price is for natural gas and the highest is the electricity.

Specifically in the HEP owned DHCs any modernization activities are done by own investments by the HEP. In 2004, the amount of investments in HEP DHC was 1.75 billion HRK. The majority was invested into construction and pre-construction of new energy facilities and into customer connections - 961 million HRK, and 521 million was invested in replacement and reconstruction of existing energy facilities. Other investments include construction of the connecting steam pipe in Sisak TPP; reconstruction of the heating station of the hot water line in TE-TO Zagreb; installation of the device for automatic cleaning of the cooling system in TE-TO Osijek.

## Estonia

Estonia<sup>48</sup> has privatized some its DH assets, particularly in larger cities, while the majority of DH systems still remain under municipal or mixed ownership and operate within the framework of municipal utility services. On its route towards EU accession, Estonia has also opened up the gas, electricity and oil product markets to competition. Some of the DH systems privatized were purchased by foreign companies including Dalkia (France), Fortum (Finland), and Wattenfall (Sweden). Aside from full privatization, other private sector participation options were also used. Some municipalities leased their DH utilities for private operation (see details on the largest Estonian DH in Tallinn in Annex 3).

The heating systems in Estonia, similar to many other countries in the region, have large excess installed capacity. The large losses in the pipes and low system efficiency resulted in many disconnections in areas with natural gas pipelines. Smaller gas-fired centralized HOBs came to replace DH in such locations. Most consumption is metered on building level, and the cost is allocated between the apartments by floor space.

Estonia established its heat sector legislation through the District Heating Act of 2003. The Act regulates activities related to the production, distribution and sale of heat by way of district heating networks, and connection to networks, ensuring fair, transparent and reliable service, at a justified price and in compliance with environmental requirements.

Estonia is one of the few transition economies to continue to practice district heat *zoning*, which is another provision of the above DH Act. With zoning, a municipality has the authority to designate an area within which housing connected to district energy systems must use district heating rather than some alternative. The municipality selects the boundaries of heating options based on their economic features, and defines the connection and disconnection terms. Nevertheless, zoning is not practiced by the majority of Estonian municipalities, largely due to lack of local expertise and capacity to duly carry out the analysis of all scenarios and select the best combination of heating options. Hence, assistance to the municipalities is necessary to promote this practice.

Until recently, the DH sector was under zero-rate VAT taxation to help maintain a low service price, but that incentive was gradually phased out and by 1 July 2007 the VAT on DH sector will be 18%. Under such circumstances, the future of DH will be questionable in many locations unless VAT-exemption and zoning continue to sustain the industry.

Since 2003 the privatized apartment owners joined in home-owner associations and signed contracts with heat suppliers, as well as housing maintenance companies. In many cases, HOAs maintain the building facilities themselves.

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<sup>48</sup> This section was largely prepared using the OPET Estonia report on “Recommended Tools to Overcome Barriers to RUE at the DH Sector Level”. May 2004.

The generation, distribution and final sale of urban heat is usually unified under single business operation in Estonia. In exceptional cases, the generation and distribution is carried out by different companies. About one-third of urban heat is generated on cogeneration plants. A holistic CHP development program within the framework of the EU CHP directive will help increase the share of CHP heat and electricity in the energy market.

The local financial market and guarantee facilities offer financing mechanisms for investments in DH modernization, even by municipalities (within the legal limitations for municipal borrowing). EU Structural and Cohesion funds, as well as limited state financing are available for the sector.

## Georgia

All heating systems have stopped in Georgia with the collapse of Soviet Union. People use various stoves and heaters operating on electricity, kerosene, natural gas, wood and even organic fuels for heat and hot water preparation. The share of natural gas use has been growing recently. The growing gas prices and the efforts of Georgian Government to diversify the gas import channels are the factors affecting the further dispersion of direct gas heating throughout the country.

To allow for effective rehabilitation of efficient central heat supply, the Government, with donor technical assistance, is currently developing geothermal heating as an option of Georgian cities. At present, about 250 single and group natural springs and artificial wells with water temperature of 30-108°C are registered in Georgia.

## Hungary

Before 1990 the Hungarian district heating sector was fully state-owned. To guarantee the continued maintenance of the DH system, a legal provision mandating the municipalities to be in charge of heating was implemented. According to Act LXV/1990 on Municipalities the ownership of district heating infrastructure was given to municipalities. The municipalities do not only provide district heating, but also set the prices. Moreover, according to the XVIII/1998 Act of District Heating the provision of district heating is the municipalities' responsibility, which persist irrespective of what tasks do the municipalities assign to any players.

The Act also has ordinances which states that a 25% share of a heat supply company can only be sold to a single person or enterprise if the regulating authority gives permission. In July 2005 a new act (XVIII/2005 Act on District Heat Supply) came into force replacing the previous act from 1998. The administrative spheres of authorities in the fields of authorization procedure, price regulation and customer protection have changed.<sup>49</sup>

### Box A5. Hungarian Heat Sector: Key Facts

- 240 district heating systems in operation in 97 settlements
- 650,000 heated flats
- 16% of residential consumers supplied by DH
- 6,500 MW DH peak heat demand

At present, district heat suppliers are predominantly owned and operated by municipal entities, but sometimes have mixed share-holders or are operated under concession. The concession (Act XVI/1991 on Concession) has great importance in privatization process. However, the investors try to avoid concession contracts due to their very strict requirements. Nevertheless, some of the early PSP experiences were registered in Hungary through concession contracts.

The 60-70% of all heat consumption is provided by large power plants and heat boilers (above 50MW), which are under foreign ownership and are operated with mandatory licenses, while the small power plants are owned by industrial companies, professional investors and entrepreneurs. The only exception is Jászberény, where the DH was supplied from the factory plant, which was privatized in the early 1990's by Electrolux. However, the company financed the introduction of individual gas heating to divest itself off the communal utility burden.

It is important to highlight that termination of district heating can only be reasonable if the whole system will be decommissioned. The partial terminations will make the situation only worse, since a smaller group of customers have to pay the same fixed component of heat costs. Nevertheless, the studies for Hungary show that any heating option with the exception of centralized heat supply would be sub-optimal according to comprehensive analysis of all investment needs, housing and fuel infrastructure needs, current building design, health, environmental and safety consideration. Moreover, the position of DH in Hungary has strengthened in the recent years; the market not only stabilized but also grew due to the increasing demand from commercial consumers and office buildings. Universal metering, which started since 2003, has helped commercialize the heat supply while promoting efficiency of end-use.

The legislation favoring CHPs under 50 MW not only promotes cogeneration, but also results in low heat prices. With the tightening environmental regulations in the EU countries and the Kyoto protocol, Hungary is looking at further development of cogeneration, utilization of waste heat and biomass. Hence, the position of DH will remain strong in the upcoming years.

<sup>49</sup> Source: <http://www.eh.gov.hu/home/html/index.asp?msid=1&sid=0&hkl=101&lng=2>

## Kazakhstan

The country started restructuring its energy sector in 1996 and over the next 2-3 years privatized a large share of its electricity and district heating assets. The companies supplying fuel to energy producers as well as the residential housing stock were also privatized. This has improved the performance of most of the district heating systems. Heat tariffs were increased and heat suppliers no longer receive subsidies in most cases. However, the privatization did not solve the problems related to tariff regulation and low interests of investors. A cost-based approach to tariff regulation does not encourage operators to cut expenses and invest in energy efficiency measures. Moreover, the low profitability due to the current tariff structure, which does not include depreciation, turns away investors and discourages energy efficiency improvements.

### Box A6. Key Facts on the Kazakhstan Heat Sector

- There are 42 large district heating systems connected to 38 large CHPs and 30 large boiler houses.
- 80% of apartments in Almaty and almost 40% of Kazakhstan receive heat from DH.
- 60% of residents in smaller towns receive heat from smaller boiler houses (with less than 20 Gcal/h capacities).

Currently, 45% of the country's cogeneration plants connected to district heating systems is private, another 35% are joint-stock companies with combined private and municipal ownership, and the remaining 20% are fully owned by municipalities.

The majority of buildings in large cities receive district heating and hot water from CHP plants (mostly coal-fired), in smaller towns – from smaller boiler houses<sup>50</sup> (heavy oil fired), whereas most of the urban population with no access to DH use coal as a fuel for stoves. It is worth mentioning that the quality of heat supply in most of the DH systems in Kazakhstan is unsatisfactory, as most of the plants are low efficient and rather obsolete due to their age (more than 20 years old). However, very few residential consumers were disconnected from DH, because of the lack of other heating alternatives. There is no natural gas supply infrastructure in the population centers in Kazakhstan; and consequently the district heating companies have no competitive pressure from natural gas suppliers.

Approximately 20 entities operate in the heat sector, and the sale tariff varies by regions (average sale tariff for heat ranged 6.3 – 23 USD/Gcal in 2004). There is, however, no variation in cost to different consumers. About 10% of multi-apartment residential buildings are equipped with heat meters, whereas the billing of energy use in the rest of the buildings is done according to norms<sup>51</sup> based on specifications and formulas of Kazakh building standards. The norms are calculated as an assumption for the specific energy demand (per sq. meter of heated area) for maintaining the normal comfort level for consumers. Nevertheless, the existing methods of norm calculations are not accurate.

On this regard, the energy supply company in Karaganda (Karagandy Zhuly) suggested that their norms verify empirically. The company has identified 16 types of buildings, for each of which an energy metering is done in order to establish the correct level of energy consumption. It is likely that this method of verification for norms will be widely adopted following the recommendations of the Government of Kazakhstan.

<sup>50</sup> In some regions of Kazakhstan (Kustanay, North-Kazakhstan, Karaganda, etc.) autonomous heating systems (2000 units) are installed instead of less efficient boiler houses. The reasons are the high costs of heat production with boiler houses and the low level of payments.

<sup>51</sup> According to Almaty Power Consolidated (APK), the Almaty energy supply company, norms are regulated by the Ministry of Energy and Mineral Resources and Regional departments of the Natural Monopolies Regulation Authority (Antimonopoly Agency).



## Latvia

The Latvian heat sector has developed dynamically and its problems today significantly differ from problems even few years ago. More and more boiler houses are operated on commercial bases. The main solution was the Regulation of Cabinet of Ministers about licensing of energy sources. It is possible to get license only for a private company (not department of municipality). Moreover, the private energy service companies have evolved and currently 27 boiler houses are operated by such private entities.

Competition to DH from individual heating/gas has been an acute problem in the past, and it was common to disconnect from DH. With growing natural gas prices for smaller consumers, however, this trend has stopped. Nevertheless, disconnection from DH does not influence others who remain connected to DH systems.

Regulation of Cabinet of Ministers in 2000 approved methodology for calculating heat energy tariffs based on business approach. The growing heat prices do not affect collections as low-income people receive subsidies from social funds in municipalities. All other subsidies for heat generation have been eliminated. The new tariff mechanism allows energy efficiency improvement measures to be included for reducing heat losses in generation side and distribution side. These measures are also financed by grants for energy efficiency measures from European Structural funds. In large municipalities, with sufficient staffing and competence, improvements are done step by step, while in smaller municipalities and small boiler houses improvements will take more time due to lack of experience.

The Regulation of Cabinet of Ministers for sales prices of electricity produced in small scale CHP is expected to provide an incentive for CHP in the long run, more and more small scale CHP fuelled by natural gas are developed already. The latest policy in Latvia for urban heat sector is defined in the National Energy Master Plan, produced in 2006, which is a formal document. In addition, to comply with the requirements in EU energy service Directive accepted May, 2006 DSM programs are expected to develop rapidly. The cities of Valmiera and Ventspils have been implementing their DSM programs and already accomplished a lot.

Municipal energy planning develops in Latvia aiming at:

- planning development of energy systems in municipality is popular for large municipalities;
- receiving grants from European Structural funds for DH systems;
- participating in European projects, etc

Regional energy planning is also ongoing within framework of EU European Intelligent Energy Project (Limbazi region is participating)

A large number of different financing schemes for energy are used in Latvia, including loans from State treasury, from commercial banks, from Environmental investment banks, ESCO, and grants from European funds. Privatization of energy sources is continuing. There are still boiler houses owned by municipalities or DH enterprises which belong to state, but that number is reducing swiftly.

Privatization of residential housing also has significant impact on the heat sector. While HOAs are an important instrument to promote end-use efficiency and building thermal modernization, however, it remains a major difficulty to gather all HOA members and reach consensus on any decision to be reached with regard to O&M based on business approach. Municipalities are working very hard to overcome this barrier. For example, Rigas majoklis (Riga housing agency) organizes training courses for people who are ready to help their buildings to establish condominiums.



## Lithuania

This small country has recently implemented one of the region's most advanced district energy policies. The policy is considered advanced because it provides both direct and indirect incentives for efficiency and reliability. Key provisions affecting district heating are based on the "Heat Law" of 2003, and include:

- District heat customers may be exempted from paying a full tariff if their building or supply system is not maintained to standards set by the state.
- Customers are free to choose a supplier of their choice, based on considerations such as price, service, and energy efficiency measures.
- Standards are also set limiting maximum heat prices, the operation of meters, and the maintenance of equipment.

Lithuanian law separately provides for competition in gas supply and for the creation and maintenance of housing associations to represent home owners and apartment dwellers in dealing with efficiency measures and heat supply contracts.

Unfortunately, these measures were implemented either too late—most were enacted only within the past three to four years—or implemented too little to protect consumers from the price effects of high district energy costs. The average household income spent on heating in Lithuania recently was third highest in the region, reaching 4 percent of annual household income, and 20 percent of monthly income for many families during the coldest months. However, the pressure of privatization and price incentives combined to permit private investment to enter the sector starting in 2003. This quickly resulted in a 20 percent reduction in energy losses in generation and transmission.<sup>52</sup>

Lithuania's situation is complicated because it derives most of its electricity from the Ignalina Nuclear Power Plant, a dangerous Chernobyl-style reactor, and because most of the country's gas is imported from Russia. The scale of this plant drives out power competition and thus has a dampening effect on district energy because combined heat and power is restricted by the near-monopoly on electric power generation.

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<sup>52</sup> European Union, EuroHeat&Power, 2005.

## Macedonia

The most common method of heating in the residential sector in Macedonia is by wood combustion, not only in the rural areas but in the cities as well. The share of wood as a heating source in the country is almost 76%. Electricity is also widely used for residential heating in Macedonia, especially in urban areas; its share is 17%. District heating is another heating alternative, but only in the capital Skopje and the city of Bitola. The share of DH as a heating source in the country overall is 5.4%. Natural gas is still not available as a fuel alternative for households in Macedonia.

District heating in Macedonia is largely confined to the capital Skopje, with annual heat production of around 685 GWh, predominantly for residential and commercial consumers. Urban heating supply systems in the country consist of: “Toplifikacija” JsC Skopje (serving the broader area of the city of Skopje), “Skopje–Sever” JsC (for the north part of Skopje), “Energy Sector–ESM” (serving the industrial zone of Skopje), “Toplifikacija-Bitola” Ltd. (serving the residential area of Bitola), and the public heating enterprise “Doming” of the city of Makedonska Kamenica, which has been out of operation since 1998. All DHCs in Macedonia operate predominantly on heavy fuel oil.

The main DHC in Macedonia – Toplifikacija JsC Skopje was founded in 1965. Privatization of the company was started in 1999. After a public announcement, an agreement was concluded with the Privatization Agency for the sale of the social capital of Toplifikacija. It became a shareholding company with mixed ownership. The heating plants were privatized while the distribution network remained state-owned. Skopje Sever JsC is a new company, founded in 2000. It operates as an independent producer of heat energy but it is a subsidiary of Toplifikacija JsC Skopje. The state-owned Electrical Power Company of Macedonia (ESM) has become, since 1997, the owner of the Energy Division of the Iron and Steel factory in Skopje (RZS), including a number of steam boilers and turbines, which have been appropriately modified to provide heat. Toplifikacija JsC Skopje and Primatehna (company from Bitola) have created “Toplifikacija Bitola” Ltd. in 1999. In 2006 about 20% of the Toplifikacija JsC Skopje shares were sold to a Slovenian investment fund, thus involving foreign ownership in the company. The rest of the shareholders are local and smaller than 5%.<sup>53</sup>

The Ministry of Economy is responsible for the energy industry in Macedonia. In addition there is the Energy Regulatory Commission (ERC) which was established in 2003 and which is moving to regulate electricity, heat and gas tariffs and to provide licenses for the main participants. According to the Methodology of Prices, the DH price is based on normalized costs, which have been accepted during the functioning of the system in the past, and contains a certain recognized profit. This means that if the system is more efficient than the previous one, profits will increase; conversely, if the system is operated inefficiently, it will create losses. A profit ceiling of 8% was determined. In accordance with pricing methodology, profit will be reduced if the DH company is not working efficiently; losses cannot be charged to the consumers. The current heat price in Macedonia is market dependent, determined in three categories: householders, schools and hospitals, and commercial. The payment can be realized on two ways: to divide expenses into 12 or 6 equal parts. In Macedonia the price of heat energy has not been subsidized since the process of privatization of the DHC in Skopje was launched in 1999. In 2005 the DH price was cheapest compared to the price for heating with electrical energy and other sources in residential sector. The most expensive heating alternative is the light oil heating about twice more expensive compared to DH.

Historically, Macedonian households connected to DH have not had their heat usage metered and still a large percentage of the supplied heat energy is billed on the basis of the heated area. According to expert assessments for Macedonia this percentage is approximately 80%. At the end of 2005, residential buildings connected to DH were not yet all equipped with heat meters on a building level. Heat metering on the apartment level has not yet been introduced. Investments for development of the DH sector in Macedonia in the last few years are mainly with funds from Toplifikacija-Skopje,

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<sup>53</sup> Toplifikacija Skopje is involved in other energy projects as well: it is building a new power plant where 30% shares will belong to AD Skopje and 70% - to the Russian SITERA; at the same time as part of consortium Toplifikacija-Skopje pursues small hydro power projects.

including upgrade the existing system and buying-out shares of Sever JsC – Skopje for the price of 5 million DEM. Also the new district heating system in north part of the city with a demand of 25 MW was connected. Investments amounted to 7 million DEM. In 2000 Toplifikacija Bitola began its activities. Investments in equity mainly directed to thermal energy sources, in the network, and in procedures for measuring the delivered thermal energy are made from the current accumulated depreciation funds.

## Moldova

Recent dramatic changes in the heat sector were caused partly by the elimination of the state subsidies to heat suppliers and transfer of ownership to municipalities, which were not able to manage and financially sustain this kind of service. Another crucial factor was the high price of heat supplied by DH companies that consumers could not afford. That is why, at the beginning of the 1990s, only eight district heating companies were operating out of more than 40 previously operational. In 2006 only three operational DH systems remain – two in Chisinau and one in Balti. At the same time, the level of worn equipment and pipes is very high and inefficient, resulting in large losses and high costs for heat in operational systems.

Most district heating systems needed to be re-designed and good management of the city is the key for finding solution for this kind of problems, as presented in the case of Ungheni Municipality.

A tremendous influence on the sector development has the political factor which represents in some cases an impediment. For example, Municipal Councils have to approve the heat tariff and this creates big problems since councilors do not want to raise tariffs due to political reasons, which results in financial insolvency of heat suppliers. Still, as a result of the efforts in the sector, including with the support of international financial institutions and donors, the heating sector in Moldova has experienced some developments, including improvement of legal framework and promotion of new technologies and practices.

In order to overcome the difficult situation, the Government has to adopt a policy in this sector that would support development of district heating as being the best option for providing heat in urban area by assuring the right political support and development of legal framework. At the same time it is needed a separate attention to be paid to the implementation of investment projects in this sector as on the supply side as on the demand side. In this respect it is needed the creation and development of different financial mechanisms in parallel with the institutional development of both sides.

The political factor should be avoided in matters related to heat sector as well as any other utility. One solution could be to transfer heat tariff approval to the National Agency for Energy Regulation, an independent Agency.

As a result of the USAID-funded work conducted by the Alliance to Save Energy, two legal acts were elaborated: Draft Heat Law and Draft Strategy on Heat Sector Development. The Strategy on Heat Sector Development was approved and adopted by the Government in February 2003 and represents a background for elaborating the Program of Restructuring of DH systems in cities elaborated by the Ministry of Energy in 2003.<sup>54</sup> This Program presents a short analysis of the situation in each city and proposes different options recommended for restructuring the heating system in each city.

The second legislative document – the draft Heat Law – was elaborated by Alliance to Save Energy and submitted to the Ministry of Energy in September 2002. This act was approved by the Government and passed the first hearings in the Parliament. After that, it was returned back to the Government for improvements. However, the energy policy priorities have shifted and due to staff changes at the Ministry of Energy, followed by complete elimination of this Ministry have significantly slowed down the heat sector reform process and lost its champion. At the moment

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<sup>54</sup> For more information, see [http://www.edwg.md/english/en\\_docs/hsconcept.pdf](http://www.edwg.md/english/en_docs/hsconcept.pdf).

Ministry of Industry and Infrastructure, which inherited the energy sector policy role, is working on new comments provided by different stakeholders to re-submit it for approval to the Parliament.

## Poland

Poland took a tough but deliberate approach to energy reform, imposing hard budget constraints and price rationalization early (though not through privatization and complete decontrol). Poland has substantial energy resources. Due to weather heat supply constitutes one of the most important sectors in the Polish energy economy, as approximately 50% of primary energy is utilized for heat generation. Space heating and domestic warm water constitute approximately 80% of energy consumption in housing sector.

The Polish DH sector reform started with the new legal framework, formed by the Parliament in 1990, shifting DH ownership and responsibility for heat supply to local authorities. The Act on Privatization of the state-owned companies changed the ownership of power plants and heat sources; while the Act on Communal Economy of 1996 started institutional restructuring of DH Companies into Joint Stock, or limited liability companies, or into budgetary units. Most municipalities established their own economic entities operating DH assets, stimulating further transformation and restructuring of DH sector in Poland.

Since the Energy Law of 1997 Poland started realizing its long term energy sector restructuring program, defining in Assumptions to the Energy Policy. Since 1997, the newly formed Energy Regulator started licensing of DH Companies and heat tariffs approvals. Subsidies were gradually eliminated until 1998. Instead targeted social assistance for low-income households was launched, resulting in improvement of DH Companies financial situation (increasing collection rate). The financing was mainly using the financial sources available in DHCs. The World Bank loan for five largest DH systems restructuring gave start to uptake of modern technologies. The reforms and World Bank improvements led to significant accomplishments, including the following:

- Increased operating efficiency; DH staff reduced 25-30%.
- Physical efficiency: 22% energy savings in DH operation.
- End-use savings: 18% reduction in energy required to heat a unit of floor area;
- Tariff decrease: real heat tariffs dropped more than 50%.
- Consumer subsidies, previously 78% of bills, were eliminated.
- Consumers were given control of their heating levels, allowing them to limit heat costs, balance comfort, and providing incentive to conserve.”

Presently, the Polish DH systems are economically viable, and their economic condition is better than it used to be 10–15 years ago. The systematic growth of heat prices from 1990 caused an increase of customer’s interest in reducing heat bills owing to demand side management (DSM), which concerned mainly improvement of building’s thermal insulation and implementation of automatic control and measurements of heat supply, resulting in decrease of heat losses and reduction of heat consumption. Modernization of buildings owned by housing cooperatives was subsidized from the state budget.

A major boost to the DSM Process was the housing policy of the government, which stopped financing of the communal (municipal) housing stock development and started supporting of the housing cooperatives through the Act on Support for Thermo-Modernization Investment (ASTMI), with state funding for thermo-modernization investments in the initial phase of implementation. According to the heat tariff ordinance of 1998 the measurement of heat became obligatory in every building connected to the DH network. During the 1998-2000, a great effort (financial and organizational) has been made to equip thousands of substations with heat meters in all DH systems. The DHCs were obliged to equip each connection to the substation with heat meter. This was largely promoted by the new regulations that came into force in 1999 implementing a new tariff system based on justified costs of heat production, transmission and distribution. According to this system the two-part tariffs, hence metering, are obligatory for heat sources and DH networks. Since 1994 every new multifamily building had to be equipped with thermostatic radiator valves and heat costs allocators. A

large number of existing (older) building were equipping with those devices in frames of Thermo-modernization program.

Substantial end-use improvements in apartment buildings were stimulated by the Act on Supporting Energy-Efficient Retrofitting Projects and the associated Thermo-Modernization Fund. As detailed in the companion report by Alliance to Save Energy, “Addressing Affordability of Utility Services in Urban Housing: Energy and Water Efficiency Solutions”, the program provides assistance for the installation of heating systems and insulation/weatherization improvements. Energy audits must verify that the improvements will meet technical and financial criteria, including savings of at least 20-25% (actual savings are within 3.5% of the savings predicted by the energy audits). Financing of 80% of the project costs is available from 22 participating commercial banks. A government ‘bonus’ grant of 25% of the loan amount is paid to the commercial bank after the improvements are installed in accordance with the audit. By May 2006, over 6,000 projects were implemented, primarily among housing associations and cooperatives, and by spring 2007 there was a waiting list of over 2,000 applications.

The above measures, combined with elimination of heat subsidies, achieved a better situation of the heat market in 1998, and allowed implementing a completely new price regulation system adjusted to market economy conditions. Without pricing reform, the DHCs could not deal with the consequences of DSM bringing to significant demand reduction, while the systems operated at the same capacity.

However, regardless of lengthy reforms, there are still problems that requiring further restructuring, and technical assistance.

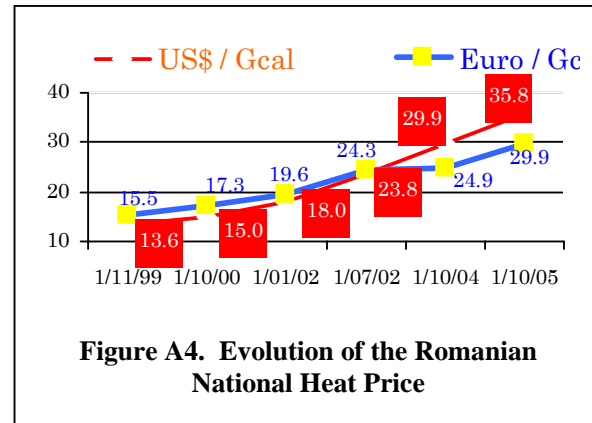
Some remaining problems are as follows:

1. Remaining cross-subsidies in power and gas sectors, the latter contributing to the low competitiveness of DH against direct gas heating;
2. Regulations concerning combined heat and power production and calculation of heat and electricity prices are still unclear;
3. Available statistics does not cover the whole heat supply sector complicating analysis and regulation;
4. Municipalities are still not interested in local energy planning.

The next steps of successful restructuring of the Polish DH sector are connected with privatization as well as organizational and economic restructuring of DH Companies. Best results observed during the past five years were in public-private partnerships.

## Romania

Reform of the Romanian energy sector separated energy related activities, and established specialized utilities for production, transport, supply and distribution. Hence, all municipal DH plants should have been transferred from the National Power and Heat Producer “Termoelectrica” into the administration of the Local Councils (municipalities). However, the transfer made little progress because many Local Councils refused to take over the plants, due to the lack of funds necessary to cover fuel costs and heat subsidies or handle the poor condition of DH plants and networks.



**Figure A4. Evolution of the Romanian National Heat Price**

By 2001 the former Government decided to equalize the gas prices (*the gas price distortion*) for industrial and residential sector, which promoted the implementation of individual heating with apartment-level gas boilers and reduced the number of operating DH utilities by over 50%. However, the decentralization was stopped when the gas price for residential sector came higher than for industry. Starting in 2005, the subsidies were gradually eliminated (from US\$327.43mln in 2004 to US\$84mln in 2006). As of 1 January, 2007 all subsidies to residential end-users were eliminated. However, the state chose to still contribute to 45% of fuel purchase costs and modernization expenditures of DH plants and networks.<sup>55</sup>

Continuing the reform, based on the Government Ordinance No.36/02.08.2006, the National Reference Price (NRP) for Residential Heat was eliminated (**Figure A4**) and replaced by the Local Reference Prices (LRP), set by ANRE, along with the Ministry of Public Administration and the Local Councils. According to the Local Councils’ decisions, the large towns, continued charging the last approved National Reference Price (35.8 US\$/Gcal), while many other towns – due to different registered losses, fuels and climate conditions – were obliged to apply higher Local Reference Prices, placing their residents under heavier utility bill burden. If in the past NRPs were set below cost-recovery level and national government subsidized the DH companies to compensate for losses, the municipality may now establish the local reference price below cost-recovery level keeping the need for subsidies. Many municipalities still provide fuel subsidies to the DH companies. Transition is being made to targeted subsidy mechanism, which is already in place but will have to be further developed.

During August – December 2006, the Romanian Government took further steps in reforming the DH system, including the following:

1. **Approval of National “District Heating 2006–2009 Quality and Efficiency” Program<sup>56</sup>** – providing interested municipalities funds for DH modernization with the condition not to privatize for 5 years (60 municipal projects have been already registered). The Local Councils are also encouraged for participating in public-private partnerships (PPPs) or concessions, when not applying for the DH program.
2. **Approval of binomial heat tariff** – alternatively to usual invoiced heat bills, HOAs may chose to pay by a pre-approved binomial tariff. Two alternatives are offered for the binomial tariffs with either higher fixed component and lower variable component, or vice versa.<sup>57</sup>

<sup>55</sup> Heating subsidies for DH systems do not cover the costs for the hot water. Meanwhile, subsidies are offered to low-income families for additional gas bills associated with heat and hot water preparation on apartment-level, indirectly supporting the individual boilers.

<sup>56</sup> The total Program value is €3.7 billion (13.4 Bill. Lei), of which €3.47 billion (12.17 bill. Lei) involve bank loans, which will be returned by the Ministry of Public Administration (50%) and by the municipalities (50%).

<sup>57</sup> 1) B1: with the fixed average components of US\$0.108/day and US\$0.003/day\*m<sup>2</sup> for hot water and heating accordingly and the variable component of US\$25.5/Gcal;



3. **Approval of heat aids** – with rising heat prices, the Government decided to adjust heating aid with regard to inflation, minimum fixed income and new heat tariffs for better social protection of low-income families. Fixed heating aid was offered to families based on their annual revenues. In 2006, the heating aids varied in size by income levels and shares of heat bills covered by the state.

## Serbia

The Serbian urban heating sector passed through a deep crisis between 1990 and 2000. The recovery process began in 2000, followed with strong international support. Determination of pricing for district heating service lies with the authority of local administration (city hall/municipality). Users (residential, public, commercial) pay their bills per square meter of heated space. Since the decision for district heating prices is under city/municipal control, there is a large price variation between Serbian cities (from USD 3.5 to 6 per square meter for the residential sector, and from USD 10 to 40 per square meter for the commercial, industrial and public sectors. This variation is partially a consequence of different conditions (different fuels and different network scales and densities), but very often is a political decision to please voters.

During its first post-transition winter, Serbia faced a significant electricity deficit as electricity was frequently used for heating purposes. The citizens for the first time faced steep increases in electricity prices (from about .5-1 cents per kilowatt-hour to 2 cents, although still well below production cost). This price increase – with help from USAID, the Alliance to Save Energy and Nexant in the form of a large public awareness campaign to get people to conserve energy – led to some measurable results:

- Electricity consumption for heating decreased by 1700 GWh or 22% from the previous winter (using weather-adjusted data).
- About 10% of households switched from electric heat to another source of heat.
- Total winter electricity consumption (for all uses, not just heat) was decreased by 5.5% and peak demand by 7% (500 MW).
- According to surveys, about 400,000 households improved window insulation.

The estimated average efficiency of DH boilers and DH networks is about 75%. A survey conducted in all DH companies shows that most significant problems affecting the supply side efficiency of energy use are as follows:

- ↳ Insufficient price: too low to allow for cost recovery and efficiency upgrades;
- ↳ Absence of metering;
- ↳ Poor condition and low efficiency of equipment and networks: old equipment, insufficient maintenance. Average boiler equipment is over 28 years old, average age of networks and substations is over 20 years); and
- ↳ Low level of automatic regulation, control, and monitoring.

Efficiency of energy end-use for space heating is also very low in Serbia. Analysis shows huge specific heat waste for residential and some type of public buildings. Implementation of energy efficiency projects on multi-apartment buildings is limited due to weak authority of home owner association (HOA). Even this association has a bank account and a stamp and decisions should be made with simple majority of building owners, in practice, there are several potential problem areas in the work of home-owners' association: The Law does not provide for a penalty mechanism to force the HOA minority to comply with the decision of majority; and the HOA does not possess property which could be used for loan guarantee.

In last five years, several important laws were adopted in Serbian parliament:

- Energy Law (2004),

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2) B2: with the fixed average components of US\$0.15/day and US\$0.01/day\*m<sup>2</sup> for hot water and heating accordingly and the variable component of US\$18.17/Gcal.

- Law on Environmental Protection (2004),
- Law on Concessions and Foreign Investment (2003),
- Law on Planning and Construction (2003).

Due to delay in by-laws preparation, some conflicts with other (older) laws as well as due vague description of penalty articles, full implementation of these laws still lacks.

In addition to the laws, the Serbian Government adopted the Strategy of Serbian Energy Sector Development up to 2015 (adopted in Serbian parliament on May 2005), and the respective Program for Implementation of this Strategy (adopted on January 2007 – Serbian Government Decree). Several technical projects will be realized as well. One of the most interesting is the “Loan for family house insulation”, a € 10 million from Serbian National Investment.

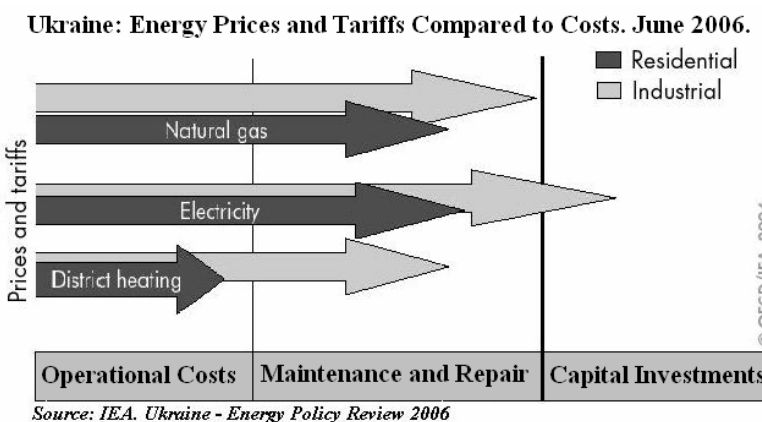
## Ukraine

Currently about two thirds of Ukraine's population are supplied by district heating systems (87.7%) and hot water supply (75.8%). 40% of all heat energy resources consumed by the Ukrainian DH sector is used to supply multi-apartment buildings.<sup>58</sup>

Only 4-5% of residential buildings and practically all of the public buildings are equipped with heat metering devices. In the industrial sector this figure amounts to 35-50%. An increasing number of consumers have installed hot water meters for their private flats.<sup>59</sup> As usual such a meter pays back within 5-6 months. Almost all boiler houses are equipped with heat meters installed at the outlet. However, it is common to break them, as DH companies are not interested in registering the actual heat produced or delivered to the consumers – in order not to reveal huge losses in the DH distribution systems, and continue charging for heat on the basis of normative figures. Lack of metering, low collections combined with the consistent failure on behalf of the state and municipal entities to transfer the committed subsidies to the utility enterprises created gigantic debts. All Government efforts to restructure debt or make tariff modifications have only partially solved the problem. As a result, not only the DH companies can not perform basic maintenance and renovation or pay for the consumed gas, are on the verge of bankruptcy, but also face massive accidents (for example, the heat supply of the city of Alchevsk collapsed in the cold winter of 2006).

### Box A7. Key Facts on the Ukrainian Heat Sector

- Ukraine has about 100,000 heat-only boiler houses and 450 CHP plants including industrial (IEA '06)
- Ukraine's heat energy demand is 307,000 GWh/yr (1,105 million GJ/yr) of which:
  - housing and communal sector – 58.3%,
  - industry – 40.2%, and
  - agriculture – 1.5%.
- Many boilers are obsolete with efficiency below 82% (76% on average); 24 % boilers are more than 20 years in operation.
- Annual fuel consumption: 11.5 mln tons of fuel equivalent.
- Annual heat production: 60 mln Gcal.
- Total length of heat supply networks: 24,300 km



**Figure A5. Degree of Cost-recovery in the Ukrainian**

About 1/3 of all boilers need urgent rehabilitation or rather replacement. The World Bank estimates that the cost of upgrading Ukraine's DH systems and for improving the energy efficiency of buildings which receive this heat is about \$5 billion for the next five years.<sup>60</sup> There is significant overcapacity of the heat generation facilities due to the drastic drop of the heat output during economic transition. This reduces the efficiency of generation and leads to excessive fuel use. Moreover, the poor thermal performance of buildings is another area requiring urgent intervention to optimize the heat demand.

<sup>58</sup> *Ukraine: Market Potential for District Heating Projects in the Ukraine and their Modernization with Austrian Technology*. Final Report. Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management. Vienna, December 2004.

<sup>59</sup> *On Main Tasks of the Ministry of Construction, Architecture and Housing and Communal Economy of Ukraine for the Year 2006*. Information and analytical materials for the board meeting of the Ministry of Construction, Architecture and Housing and Communal Economy of Ukraine, Kyiv, January 2006.

<sup>60</sup> *Ukraine Multi-Donor Municipal Heating and CHP Modernization Strategic Assessment Report*, March 2007.

Ukraine's Energy Strategy up to 2030 estimates that fuel use can be reduced by 8% by 2010 and by 16% by 2030 equivalent to 2.98 Mtoe and 4.13Mtoe, respectively.<sup>61</sup>

Ukraine imports half its primary energy—and most of that from Russia—making energy both an economic and security concern. Ukraine has raised fuel prices to world levels, but not the cost of district heat, which is heavily subsidized from central and local government subsidies, and experiences unrecovered costs and non-payments that, combined, provide heat at 75 percent less than cost to most citizens. The non-payments problem has eased since 2000, during which time collection rates for consumer energy bills have risen from less than 50 percent to above 80 percent.

A recent pricing dispute arose between Gazprom, the Russian gas monopoly which provides 80 percent of Ukraine's gas, and the Ukrainian government. Ukraine claims it had a long term contract to obtain gas from Russia for under \$2 per gigajoule (GJ), while Russia claims that the pricing arrangement was subject to annual change. Russia attempted to increase the price of its gas to Ukraine to roughly \$9 per GJ, but when the dispute disrupted the transport of gas across Ukraine to Germany and elsewhere, Gazprom agreed to a short-term price of roughly \$4 per GJ. The dispute made Gazprom and the Russian government vulnerable to criticism that it uses energy resources as an instrument of foreign policy, just as it has made the economic recovery in Ukraine appear tenuous. It is naturally an energy security issue for an economically distressed nation like Ukraine to face doubled energy prices. The price of gas to Ukraine, however, even after the doubling, is not exceptional by international comparison (the average European price is \$265 for 1000m<sup>3</sup>).

The district heating sector is at an earlier stage of reform, although the government has recently done significant work to outline a new sectoral strategy and has adopted a Law on Heat Supply. There is need for better coordination of government efforts targeted at improved generation efficiency, reduced emissions, better building energy performance, and elimination of price distortions. Some scenarios discussed for limiting imported gas demand, the Government discusses plans to shift away from district heating toward electric or coal-fired heating. Moreover, need for targeted social assistance instead of universal subsidies has matured – in 2006 the decision to raise gas prices has brought 200,000 people to the streets of major Ukrainian towns in protests.

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<sup>61</sup> *Ukraine Energy Policy Review 2006*. OECD/IEA. Paris 2006.

## ANNEX 2. EU POLICIES RELATING TO URBAN HEATING

The new EU members of the CEE region are now significantly driven by EU legislation. The European Union has started a process of revisiting energy efficiency targets on the regional as well as national policy agendas. The Green Paper on Energy Efficiency released by the European Commission in June 2005 reviewed the existing issues and actions with respect to the current energy situation; it was widely discussed and commented by a various stakeholders. The next step calling for stronger energy policy was the Green Paper on a European Strategy for Sustainable, Competitive and Secure Energy, adopted in March 2006. The subsequent document released by the European Council in spring 2006 was the Action Plan on Energy Efficiency outlining the priorities and actions, in the matter of their urgency.

**The EU Action Plan on Energy Efficiency** has laid out an ambitious plan to cut its energy consumption by 20% by 2020 in an attempt reduce Europe's dependence on imported fossil fuels while cutting energy bills by an estimated 100 billion Euro every year. If successful, the plan would also result in prevent 780 million tones of avoided CO<sub>2</sub> emissions, which is twice the EU target under the Kyoto Protocol on climate change.

Legislative support for the energy efficiency policy initiatives had started long before and was pursued by the European Commission through a number of programs and directives including the following:

- **Directive on energy performance of buildings**

The aim of improved energy efficiency has been set out in earlier existing legal instruments. Among the main Community legislation for the sector are the Boiler Directive (92/42/EEC), the Construction Products Directive (89/106/EEC) and the buildings provisions in the SAVE Directive (93/76/EEC). The Directive on the energy performance of buildings in force since January 2003 builds on those measures with the aim to provide for an ambitious step-ahead to increase the energy performance of public, commercial and private buildings in all Member States.

- **Directive on the promotion of cogeneration of heat and electricity**

The objective of the Directive is to increase energy efficiency and improve security of supply by creating a framework for promotion and development of high efficiency cogeneration of heat and power (CHP) based on useful heat demand and primary energy savings in the internal energy market, taking into account the specific national circumstances especially concerning climatic and economic conditions.

- **Directive on energy end-use efficiency and energy services**

A directive on energy end-use efficiency and energy services was adopted in December 2005. The directive requires member states to draw up national action plans to achieve 1% yearly energy savings in the retail, supply and distribution of electricity, natural gas, urban heating, and other energy products including transport fuels. The 1% target is only indicative but the national action plans will need approval from the Commission and will be reviewed every three years. The process will be spread over nine years, starting in January 2008.

Other EU measures include: energy-efficiency requirements for boilers and refrigerators, requirements for Energy Star labeling and the Directive on taxation of energy products and electricity.

For the urban heating sector in the EU Accession countries, the European Directives above have served as a major boost to promoting the supply- and demand-side efficiency of heat supply through the promotion of CHP and improved building thermal performance, particularly with the help of EU structural funds.

**Directives concerning common rules for the internal market in electricity and natural gas:** The EU policy efforts directed to liberalization and opening of gas and electricity markets have affected

the heating market in the new EU member countries, particularly the DH / CHP sector. The recent versions of the gas and electricity directives were adopted in June 2003. These seek to achieve a full opening of the markets while maintaining high standards of public service and a universal-service obligation.

The two directives entered into force on 4 August 2003 and the deadline for transposing them into national law was 1 July 2004. They stipulate an opening of both markets for all non-household gas and electricity customers by July 2004 and for all customers by July 2007. After these dates, businesses and private customers should be able to choose their power and gas suppliers freely in a competitive market place.

The most important elements of the directives are unbundling, introduction of non-discriminatory tariffs and granting third-party access to gas storage, establishment of common minimum standards regarding public services, appointment of independent national regulators to monitor market performance and avoid discrimination, as well as establishing common rules for cross-border trade in electricity.

The EU policy development aimed at promotion of renewable energy use also has impact on the urban heating sector, as DH/CHP systems will try to utilize renewable energy to reduce emissions, limit fossil fuel use and boost regional energy security.

**EU Policy Developments in the area of renewable energy** since 1997 are as follows:<sup>62</sup>

- ❖ 1997: Commission White Paper 'Energy for the future: renewable sources of energy - White Paper for a Community Strategy and Action Plan, sets EU target of increasing the share of renewable energy to 12 per cent of total energy consumption by 2010.
- ❖ 2001: EU adopts the Directive on the Promotion of Electricity produced from Renewable Energy Sources ('Renewables or 'RES-E' Directive'). The directive sets an EU-wide target of 21% of renewables share in electricity production by 2010.
- ❖ 2003: EU adopts the Biofuels setting "reference values" of 2% market share for biofuels in 2005 and 5.75% share in 2010.
- ❖ 2006: European Parliament calls for 25% target for renewables in EU's energy consumption by 2020.
- ❖ 2007: Commission presents "Renewable Energy Roadmap" as part of its "energy-climate change" package.
- ❖ March 2007: EU summit endorses Commission roadmap with:
  - A binding target to have 20% of the EU's overall energy consumption coming from renewables by 2020, and;
  - As part of the overall target, a binding minimum target for each member state to achieve at least 10% of their transport fuel consumption from biofuels. However, the binding character of this target is "subject to production being sustainable" and to "second-generation biofuels becoming commercially available".

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<sup>62</sup> Source: <http://www.euractiv.com/en/energy>

## ANNEX 3. SELECTED PRIVATIZATION CASES

The following privatization cases present a diverse set of experiences with privatization in countries more advanced in the private sector participation (PSP) integration process.

### Hungary

Three selected Hungarian DH privatization cases documented for MUNEE contractors present a diverse set of experiences in terms of DH market, city sizes, legal solutions, etc. The cases for Hungary were documented by EGI Contracting/Engineering in 2002 (without mention of the city names per request of the municipality), for Poland – by Witold Cherubin, for Macedonia – by MACEF.

A large municipality-owned gas-fueled district heating enterprise supplied 41% of homes, consuming 1500 TJ heat energy per year in one of the large Hungarian towns. The heat tariff was subsidized by the municipality for social considerations, regardless of the fast growing gas prices. Even if tariff increase decisions were made, they were usually approved after the heating season was over; hence the companies were under heavy financial pressure.

To deal with the constant financial loss, the external audit recommended privatization or operation contract. After long disputes, an invitation type tender was issued by the city and a contract was signed between the private company and the city, in which the company promised large-scale investments in the district heating system. The company had largely utilized ESCO services to make technical improvements, such as switch to small scale cogeneration in many boiler houses.

**Complication:** The private company apparently had internal information, as it applied before the tender, and when tender was demanded, applied on competitive basis and still won. This raised concerns about the equality of terms for competitors.

Another municipally-owned district heating enterprise in Hungary supplied 40% of homes in a city, with annual heat sales of 450 TJ. The municipality issued a tender for the operation of the district heating company.

**Complications:** Because of some points of the tendering procedure that they found obscure, one of the bidders who lost the tender sued the municipality. The first forum of arbitration, the county court ruled that the contract for the operation of the district heating company and the transfer of operational rights in the city and also in a general sense is against the law because it is actually a concession agreement without meeting the criteria of the legislation on concession. The law on concession includes several tools for the protection of interests of the municipalities, which were omitted from the contract. Following the decision of the court the negotiations on similar contracts stopped in Hungary altogether.

In another Hungarian city of 28,000 inhabitants only 7% of the homes are district heated. Heat supply is partially based on the utilization of geothermal energy. The district heating infrastructure (pipes, substations, boilers) were in a rather bad technical condition because maintenance had been neglected for several years. The municipality, lacking the funds for the necessary reconstruction decided to involve private capital by issuing a tender for the concession of district heating. Learning from the example of the city in the previous case study the municipality invited a professional consultant to assist in the tendering procedure.

The tendering procedure strictly followed the requirements of the concession law. It was open for any bidders and the evaluation criteria were clear and set already in the tender document. The evaluation followed the set criteria and all bidders approved their own evaluation document in writing. Due to the correct procedure, none of the four bidders went to court or expressed their



dissatisfaction in any way. The winner has implemented several reconstruction measures since and has been running the system successfully.

## Poland

The **Kalisz** private DH company (PDHC) with joint stock ownership, established in 1994, signed a lease-contract and contract for 15-year operation of DH assets. The PDHC prepared a long-term DH system modernization plan. The inefficient coal-fired local HOB plants were liquidated and replaced by substations connected to the DH network or high-efficient automated gas fired HOB plants by 1998. This increased the efficiency by 8%. The reliability of heat supply improved significantly. The heat price, which remains lower than the average heat price in DH sector, and is acceptable for customers and approved by the Polish regulatory authority, while the PDHC's profits grow permanently.

Due to Kalisz PDHC efforts, the value of DH assets is now more than twice higher than in 1995. The own capital of PDHC has also increased due to the development of PDHC's economic activities in other fields; while in 1997 the second emission of PDHC's shares was acquired by a French company. Over the course of ten years, the PDHC activities grew and recently, aside from DH system operation only, the PDHC was transformed to encompass different services such as designing, consulting, construction, repairing and installing HVAC and automatic control equipment, etc.

**Walbrzych** PDHC (DH Joint Stock Co established in 1992) signed a lease-contracts and contracts on DH assets operation and modernization with 14 local authorities individually for 10 – 15 years. The PDHC made modernization of the DH networks and substations, since the technical condition of existing DH assets was very poor. However, the financing of one DH system modernization in larger scope is economically more viable than realization of small-scale investments made by separate municipalities. In this regard, the DH Union of Walbrzych District was established, which decided about scope and order of investments realization in DH systems operated by PDHC.

In 1996 a performance agreement on modernization of the whole DH system in Dzierżoniów city was signed with a Swiss firm. Except of the Swiss firm and PDHC, local authorities, heat users as well as Polish consulting company were involved in implementation of the project, as the particular parts of the DH system were owned by municipality, PDHC, housing cooperatives, industrial plants and other entities. The project financing was organized by Swiss firm mainly by loans from foreign commercial banks, and the Polish side covered only about 20% of investment costs. The liquidation and modernization of low-efficient coal fired HOBs, DH networks and substations were carried out under the project. Concurrently, a thermo-modernization of buildings was made by buildings' owners, which resulted in reduction of heat consumption by 40%.

The gymnasium of the elementary school in **Swiebodzice** city made a transition from the former "central planning" system to an improvised "temporary" HOB, followed by CHP. The DH system modernization and thermo-modernization of buildings resulted in significant reduction of heat consumption, an increase of heat supply efficiency, and reduced environmental pollution.

In this regard, after a few years of PDHC operation, the local authorities got more interested in selling DH assets to private investors. It is worth mentioning that the main financial sources for investments were PDHC's own funds and available supporting funds. The municipalities not only had almost no participation in the investments, they sometimes charged PDHC renting fees or received other financial means from supporting funds in order to modernize their own DH systems.

During 1993-2001 the PDHC purchased several DH systems in number of cities; constructed several new modern gas/oil fired HOBs; and signed contracts for operation of DH systems with other municipalities. In 2003 the PDHC shares were sold to a Finnish company. The transformed

PDHC finalized in 2005 purchase of the state owned DHC in Czeszochowa, which declared insolvency. The developed PDHC conducts economic activities in heat supply field in over 20 cities. In some of those cities the DH assets are still leased from municipalities or 100 % owned by PDHC, while in other cities the PDHC is co-owner of DH assets. In general, the current economic situation of the PDHC is good since the majority of customers are housing cooperatives and apartment owner's communities, which generally pay their heat bills.

In **Starachowice**, there are two DH systems with coal-fired HOBs: 1) the municipal DHC providing heat mainly to residents and 2) PEC Bugaj providing heat mainly to industrial area. Due to industrial customers' frequent change and heat demand decrease, the PEC Bugaj had financial difficulties and modernization of DH system was impossible. On this regard the company shares were sold to a consortium of American companies in 2000. Further, PEC Bugaj DH system restructuring project was prepared and a new CHP Starachowice Ltd. Co. was established in 2000, which made investments in construction of new CHP plant, which completed in 2004) but did not operate because of price setting problems. The consortium assumed that the price of electricity will be high, because of the EL provisions about obligatory purchase of electricity produced in cogeneration with heat, and heat price will be very low. But in 2004 the PERO decided about exemption of CHP plants from obligation to apply for approval of tariffs for electricity produced in cogeneration with heat. However, this project shows that the PPP is not successful always.

**Complications:** The PPP in Starachowice was unsuccessful mainly because: a) the foreign investors had lack of knowledge about Polish realities (legal, economic, etc.); and b) the municipality's position was irrational (political bias, and not economic reasoning) and caused limitations on the whole DH system restructuring (only PEC Bugaj was restructured), which had negative economic influence (economy of scale).

In 1991, the local authorities decided to establish a DHC (Joint Stock Co. with 100% municipal ownership) in the city of **Ostrow Wielkopolski** and transferred DH assets to that company. The further modernization of DH system by DHC brought the following results: 1) the efficiency of heat production and reliability of heat supply have increased, 2) the increase of DHC's profit is observed, 3) the value of DH assets has tripled from that of 1991, and 4) the heat price became acceptable for customers and approved by PERO.

In 1996, the 14 % of DHC shares were transferred to the employees free of charge. Since 1997 the turnover of the DHC's shares is permitted on the regulated public capital market and in 1998 a Swedish firm bought 5 % of DHC shares and repurchases almost all shares from DHC employees. Nevertheless, the full DHC privatization is still impossible because the local authorities do not like to eliminate single shareholder's domination. Still from the other hand the municipalities are interested in getting additional income to replenish municipal budgets, and one of the easiest ways to obtain that income is usually the sale of DH assets or DHC shares. **Thus**, even partly privatization can support local authorities in DH sector restructuring and DH systems modernization.

**Bydgoszcz** has about 380000 inhabitants and the seventh largest district heating system in Poland. Due to the bad financial situation years ago, the municipality looked for an opportunity to involve a private partner. However, due to the bad reputation of past privatization projects in Poland; the municipality preferred a municipal partner, which would be easier accepted by the population and the city council. Finally, the German company MVV Energie was selected and it acquired a share in the district heating company by capital increase (15 million Euros). After the contract was signed, the management of the company remained in office. The investor does not directly intervene in the management and daily operations. MVV's nominal share is 54%, but it has only 40% of the votes. However, decisions of the advisory board require 66% of all votes. Accordingly, both parties have to agree on all important issues.

The financial situation of the district heating company has considerably improved and it was already making profits in 2000 and 2001. The former losses were mostly due to insufficient tariffs which were not adjusted although the existing regulation would have allowed this.

Due to the overall bad economic condition of the city of **Katowice**, solving the problems of the heat generation sector was left to the private sector. A US company PSEG Global reached a financial agreement on a joint venture with the existing heat supplier and decided to build a 220 MWe<sub>el</sub> and 500 MW<sub>th</sub> combined heat and power plant in Chorzow, a small city close to Katowice where the old CHP plant is also located. The new plant was not yet been completed, but the joint venture company still operated the existing plant and delivered heat to the Katowice district heating company. The heat price was fixed in the contract and tied to the inflation rate, the only factor that would change the heat price.

The case illustrates a typical independent power producer project for a cogeneration plant. It avoids a “take-or-pay” obligation, which could be rather harmful for a district heating system whose market size would continuously shrink in accordance to energy efficiency measures on the demand side. Nevertheless, the district heating company was obliged to purchase the base load from the plant.

The cities of **Krakow**, **Gdansk**, **Gdynia**, and **Warsaw** illustrate that a successful restructuring does not necessarily require PSP. Already in the early nineties, the project development started and the first loans became effective in the mid nineties. A good example for that development process is the district heating system of Warsaw. The state-owned district heating company of the city of Warsaw (1.8 million inhabitants) was municipalized in 1992 and is acting under the supervision of the City Mayor. The assets belong to 11 communities. Operation and maintenance as well as investments are provided by the company. Based on a master plan, the company has received a World Bank loan of 125 million US\$ and was able to use 75 million US\$ by 2001 for reduction of heat losses, heat metering, and automation of heat stations. The increase in the price of heat during this period was lower than the inflation rate, and the sold load dropped from about 8000 MW to about 4000 MW due to reduction of heat losses and heat load of customers. This allows heat to be delivered according to the individual wishes of customers throughout the year.

## Estonia

The Tallinn city government planned a concession of the Tallinn Heating Co aimed at improvement of economic operation of heat supply in Tallinn. In 2000-2001 the Tallinn City administration organized sale of shares and concession of Tallinn Heating Co. through a tender. The evaluation criteria for selection were the following: 1) concession payments (30% weight); 2) proposed heat price changes for customers during 6 years (30% weight); 3) business plan (30% weight); and 4) experience (10% weight). A Dalkia subsidiary AS Tallinna Küte won the tender and signed the Concession Agreement for the period of 30 years. The Agreement has transferred the concessionaire all assets, rights, liabilities, employees and agreements of the Tallinn Heating Co under so called “enterprise transfer” concept. The city administration defined service features, environmental, safety and security requirements, monitoring rights and extensive reporting requirements for the concessionaire; as well as set tariff caps; etc.

As a result, the Concession brought the following benefits:

- ✓ The city received 210mln.EEK<sup>63</sup> initial payment and is receiving annual concession payments. The lack of cash for investments was solved well.
- ✓ The leakage reduced and profitability has increased.
- ✓ The service quality was significantly improved. A significant portion of money from consumers goes to the city budget and can be used for other purposes.

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<sup>63</sup> The exchange rate as of February 21, 2007: 1USD=12EEK.

Thus, in general it can be emphasized that this is a success story of concession experience.<sup>64</sup>

## Macedonia

In Macedonia, private participation in the DH sector is the most advanced: 100%. Privatization of the largest Macedonian DH company (which had social capital component) in Skopje started in 1999. After a public announcement, an agreement was concluded with the Privatization Agency for the sale of the social capital of Toplifikacija JsC. Toplifikacija JsC became a shareholding company with mixed ownership - Toplifikacija JsC – Skopje when shares were purchased by all employees (all employees could become shareholders, with different participation, but no one can obtain more than 5% of the shares). 95.26% of shares were held by individuals and 4.74% by the pension fund in accordance with the procedure of “Privatization by all employees”. Since then the shares have been actively circulated, changed owners, and sold on the exchange market. Similar examples are available in the Polish experience (e.g. Walbrzych PDHC), which is among the richest in PPP practices.

## Czech Republic

The City of **Prague** used to be a significant shareholder in three energy distribution companies, but in 2000 the municipality decided to team up with larger European (Germany-based) energy companies to form three energy holdings splitting the shares between the local utilities and the foreign investors.

Despite the large involvement of the private strategic investor in the district heating company, this case is in fact a good example showing that a district heating company can be restructured without PSP and that strategic private investors engaged only after a successful restructuring program has been implemented. In addition, larger investment programs have successfully been implemented and financed by commercial banks.

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<sup>64</sup> This case was described based on a presentation made by Risto Vahimets in Vilnius, on 23.11.2006.

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