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ALLIANCE TO SAVE ENERGY

Municipal Network for Energy Efficiency

Regional Urban Heating Policy Assessment

Executive Summary

July 2007

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-dept review of the above issues on a country level (available on 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

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

Units of Measure

GJ	giga joule = 10^{12} joules	**MW**	megawatt = 10^{6} watts
km	Kilometer	**MWh**	megawatt hour
kW	kilo watt	**t**	tons
kWh	kilo watt hour	**TJ**	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 of 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,[1] 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

[1] 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 couples 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

Area	Problems	Remedies
Energy Planning and Competition	***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 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	***Underinvestment and tariff subsidies***: 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	***Lack of focus on the heat sector in the national energy policy agenda*** 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	***Low efficiency of energy use*** 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	***Lack of financing*** 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. 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	***Lack of local expertise and awareness*** 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.	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.
Social Safety	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 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&M, low efficiency, large losses, poor service quality, further tariff growth and larger affordability problems.	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.
Environmental Regulations	***Weak environmental regulations*** 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.	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.
Service Quality and Customer Orientation	***Lack of Customer Focus*** 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.	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. 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.

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.