



Unlocking the Potential for Private Sector Participation in District Heating

In Partnership with





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LIST OF ABBREVIATIONS

AERS	Energy Agency of the Republic of Serbia (Serbia)
AIK	Agency for Investment and Competition (Croatia)
AJPP	Agency for Public-Private Partnership (Croatia)
CEI	Center for Monitoring Business Activities in the Energy Sector and Investments (Croatia)
CHP	Combined Heat and Power
DH	District Heating
ERC	Energy Regulatory Commission (Mongolia)
ERO	Energy Regulatory Office (Kosovo)
ESCO	Energy Service Company
FBiH	Federation of Bosnia and Herzegovina
HEP	State-owned Energy Company (Croatia)
HERA	Energy Regulatory Agency (Croatia)
IFC	International Finance Corporation
IPP	Independent Power Production
kWh	Kilowatt hour
MW	Megawatt (Total Capacity)
MW_{th}	Megawatt thermal (Heat Capacity)
MWh	Megawatt hour
NECSRC	National Energy and Communal Services Regulatory Commission (Ukraine)
O&M	Operation and Maintenance
PPP	Public-Private Partnership
PSP	Private Sector Participation
RS	Republika Srpska (Bosnia and Herzegovina)
TKE	Local Heat Supply Company (Ukraine)

Abstract

The report analyzes barriers to and opportunities for private sector participation in district heating (DH) in the Western Balkan countries of Bosnia and Herzegovina, Croatia, Kosovo, and Serbia, as well as in Mongolia and Ukraine.

Specifically, the report analyzes the legal and regulatory frameworks for public-private partnerships (PPP) and for DH in each of the countries, including an overview of the primary and secondary legislation, PPP preparation and approval processes, institutional setup of the DH sector, heat tariff-setting procedures, etc.

In addition, the report describes international best practice for various business models for private sector participation in DH and provides country-specific recommendations to improve the attractiveness of PPP in the DH sector. Finally, the report provides an estimation of the investment needs in the DH sector by country and indicates selected investment projects, which are conservatively assessed at \$1.5 billion.

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1 | Executive Summary

The final consumption of energy for heating is substantial in the Western Balkan countries (Bosnia and Herzegovina, Croatia, Kosovo, and Serbia), as well as in Mongolia and Ukraine. All of these countries have district heating (DH) in their major towns; however, the majority of these DH systems are municipally owned and have limited access to adequate investment funds, modern management practices, and new technologies. All of the countries need to allocate substantial resources for renovating old DH systems over the coming decade.

At the same time, many of these countries and municipalities have limited public finances and fiscal room to allow for adequate investments to renovate the DH sector. In this context, private sector participation (PSP) in the DH sector may bring access to private sector management practices, investment funds through capital markets, and new technologies, for example in relation to energy efficiency, demand-side management, and renewable energy-based combined heat and power (CHP) plants.

The objective of this report is to analyze barriers to and opportunities for private sector participation in district heating in Bosnia and Herzegovina, Croatia, Kosovo, Mongolia, Serbia, and Ukraine. This may help identify and develop opportunities for private sector engagement in the DH sector, which can help the transition to a more efficient energy system.

This report presents an overview of the DH sector in the six case countries, the institutional and regulatory environment for public-private partnership (PPP), as well as the legal and institutional framework for the DH sector. It provides an assessment of the institutional and regulatory framework, outlines recommendations for improvements, and identifies technical options for improvement and investment

opportunities. Furthermore, the report presents best-practice business and financing models to support PSP in DH, provides an assessment of the readiness of the case countries for PPP business models, and provides recommendations on what the countries can do to attract private capital to the sector.

The results of the study were presented at the 37th Euroheat & Power Congress on April 27, 2015 in Tallinn, Estonia. Detailed country reports for each of the six countries were prepared and can be shared with potential private sector investors/operators upon request directed to IFC (subject to getting no objection from countries' PPP agencies).

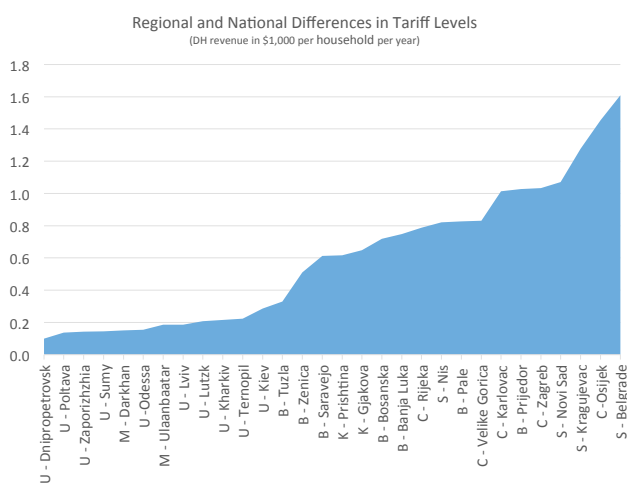
OVERVIEW OF THE DH SECTOR

District heating is the key source of domestic heating in major towns in the Western Balkan countries, Mongolia, and Ukraine. The sector is characterized by a high degree of consolidation in most of the countries, with the two largest DH systems in Bosnia and Herzegovina accounting for 75 percent of installed capacity, the four largest DH systems in Serbia accounting for 60 percent of installed capacity, the state-owned HEP Toplinarstvo d.o.o. (HEP) DH system in Croatia accounting for 6 of the 10 largest DH systems and 80 percent of installed capacity, and the sector being dominated by the DH systems in the capital cities of Kosovo and Mongolia.

The fuel choice for DH reflects the local availability of fuel sources in the individual countries. Natural gas is predominant in Bosnia and Herzegovina, Croatia, Serbia, and Ukraine, whereas Kosovo relies on heavy fuel oil (the country has no access to a gas pipeline) and Mongolia relies on coal (mined from the large domestic reserves).

Household heat tariffs vary significantly among the countries, although immediate comparison is difficult because of different tariff structures. Figure 1 illustrates regional and national differences in the tariff level, using gross revenues per DH customer as a proxy for tariff levels. Serbia and Croatia have the highest revenue basis per household, whereas Ukraine and Mongolia have the lowest.

Figure 1. Regional and National Differences in DH Sector Revenue Base



INSTITUTIONAL AND REGULATORY ENVIRONMENT FOR PPP

The legal framework in all countries is in accordance with international best practice and formally allows for private sector participation in the DH sector. However, there is still a lack of successful PPP projects in municipal services, which may create discomfort for international investors. This may reflect a general reluctance to adopt a more proactive approach to PPP in municipal services, including developing a pipeline of pilot projects, addressing the inevitable conflict between affordability concerns and financial viability, and seeking international inspiration and assistance for transaction structuring. Furthermore, the legal framework in Bosnia and Herzegovina

is complex due to the country's administrative structures, and in Mongolia the responsibility for PPP has shifted frequently in recent years, representing a risk to continuity.

LEGAL AND INSTITUTIONAL FRAMEWORK FOR DH

The DH utilities in Bosnia and Herzegovina, Kosovo, Serbia, and Ukraine are owned by the local authorities, whereas the DH utilities in Mongolia are state-owned and Croatia has a combination of state ownership (80 percent), municipal ownership, and part-private ownership. Croatia, Kosovo, Mongolia, and Ukraine have formally separated the regulatory responsibilities for the DH sector from the ownership of DH utilities through the creation of an independent regulatory authority that also approves DH tariffs. In Bosnia and Herzegovina and in Serbia, there is no such separation, although this may change in Serbia following the recent revision of the Energy Law.

With regard to financial support mechanisms, all six countries have feed-in tariffs in place for electricity produced at CHP plants in cogeneration mode that is exported to the grid, but none of the countries have implemented specific feed-in tariffs for heat production from cogeneration or renewable sources. The incentives are backed in all countries by interconnection policies that provide CHP and renewables with transparent and consistent interconnection procedures for selling the generated electricity to the grid.

Although most regulators are independent and the tariff methodologies formally allow for cost recovery, social concerns remain a significant determinant in the process of proposing and approving DH tariffs. This is because social protection programs targeted at low-income households tend to be less developed, and affordability concerns are addressed instead through low utility tariffs, which effectively act as blanket subsidies benefiting all connected households, irrespective of their income levels.

Furthermore, country-specific challenges also exist. In Bosnia and Herzegovina, complex administrative structures and a high degree of decentralization have resulted in a multitude of legal acts and regulatory bodies regulating PPP transactions and in a scattered legal framework related to

the DH sector. In Mongolia, significant subsidies permeate the entire value chain—from primary fuel supply and CHP generation, to transmission and distribution to end-users—which will make partial sector reforms difficult.

RECOMMENDATIONS ON IMPROVEMENTS

The countries can take various actions to attract private capital to the DH sector. Across all six countries, PPP in municipal services may be promoted by developing a pipeline of pilot projects for PPP in municipal services (including DH) and seeking international assistance for transaction structuring of these projects. Similarly, all countries need to improve the commercial viability of the DH sector by separating tariff approval from ownership and addressing the conflict between affordability and financial viability through targeted, performance-based subsidies. Further to these general recommendations, the individual country recommendations presented in this report will contribute to the enabling conditions for successful development of the DH sector through partnership with the private sector.

INVESTMENT OPPORTUNITIES

Although significant investments have gone into DH network improvements in all six countries over the last decade, heat and water losses remain high, and substantial investments are needed in this area for the coming decade. This investment need is conservatively assessed at \$1.5 billion. In addition, substantial opportunity exists for fuel conversion to locally produced biomass in the Western Balkan countries and Ukraine.

A review of selected DH systems has confirmed that there are substantial investment needs and opportunities in relation to continued network improvements to reduce heat and water losses (all countries), switch to cleaner fuels (Ukraine and the Western Balkan countries), and shift to efficient CHP production (apart from Serbia and Mongolia, where this is already the standard technology). There also are needs and opportunities related to waste incineration, the use of geothermal sources, the use of waste heat, extending the supply of hot tap water, and energy efficiency investments at the end-user level.

BEST-PRACTICE MODELS FOR PSP IN DH

Private sector participation in DH may come in the form of a continuum of models that reflect the increasing transfer of responsibility for service provision, ranging from management contracts to lease contracts to concessions to private provision (privatization of existing assets and Build-Own-Operate for new assets). It also may include models designed to address specific challenges in the DH supply chain, such as heat entrepreneurship (mobilizing the biomass supply chain) and energy service companies (ESCOs) (addressing investment barriers at the end-user level).

The report describes these key business models for private sector participation in DH used internationally and assesses their applicability in the six case countries. The best-practice business models are drawn from experience with management agreements in Czech Republic and Sweden; leasing in Estonia and Lithuania; concessions in France and Lithuania; privatization in the Czech Republic, Poland, and Romania; heat entrepreneurship in Finland; and an ESCO in Greece.

The study team concludes that all six case countries are ripe for management agreements in DH and that all but Mongolia (due to legal limitations) are ready for leasing agreements in DH. With respect to concession agreements, the lack of a clear strategy and sector legislation in Bosnia and Herzegovina and the need for comprehensive subsidy reform in Mongolia makes it a longer-term option, while the four other countries are ready for concession agreements in DH. Among the six countries, only Croatia has the necessary legislation in place to enable privatization.

The experience with heat entrepreneurship may inspire both the Western Balkan countries and Ukraine to consider approaches that utilize the vast biomass potential in the region. Meanwhile, ESCOs are a relevant option for implementing end-user energy efficiency measures in the Western Balkan countries and Ukraine (although Kosovo is subject to the adoption and implementation of legislative changes that are presently being planned to establish housing associations).

Table 1 provides an overview of the DH sector in the six case countries.

Table 1. The DH Sector at a Glance

	Bosnia and Herzegovina	Croatia	Kosovo	Mongolia	Serbia	Ukraine
Number of DH companies	22	20	3	7	58	21 (large)
Installed capacity (MW_{th})	1,000	2,000	200	2,000	6,000	26,000
Main fuel(s)	Gas, heavy fuel oil, coal, biomass	Gas	Heavy fuel oil	Coal	Heavy fuel oil, gas, coal	Gas
DH utility ownership	Local government	State, local government, partly private	Local government	State	Local government	Local government
Tariffs approved by	Local government	Croatian Energy Regulation Agency (HERA)	Energy Regulatory Office (ERO)	Energy Regulatory Commission (ERC)	Local government	National Energy and Communal Services Regulatory Commission
Heat tariff (for metered households in capital U.S. cents/kWh, variable element only)	4.7	2.8	5.7	0.6	7.0	2.1
Electricity feed-in tariff for biomass / CHP (U.S. cents/kWh)	8.6 / 8.6	14.5 / 9.8	8.88 / [N/A]	Negotiated	16.25 / 11.1	11.6 / [N/A]
Assessed investment need (\$ millions)	220	230	40	100+	270	600+
Assessed readiness of case countries for best-practice business models for PSP in DH						
Management agreements	Immediate option	Immediate option	Immediate option	Immediate option	Immediate option	Immediate option
Leasing	Immediate option	Immediate option	Immediate option	Longer-term option	Immediate option	Immediate option
Concession agreements	Longer-term option	Immediate option	Immediate option	Longer-term option	Immediate option	Immediate option
Privatization	Longer-term option	Immediate option	Longer-term option	Longer-term option	Longer-term option	Longer-term option
Heat entrepreneurship	Immediate option	Immediate option	Immediate option	Longer-term option	Immediate option	Immediate option
ESCOs	Immediate option	Immediate option	Longer-term option	Longer-term option	Immediate option	Immediate option

2 | Institutional and Regulatory Environment for PSP in DH

2.1 Legal and Institutional Framework for PPP

REGIONAL

In general, the legal framework in all countries is in accordance with international best practice and allows in principle for private sector participation in the DH sector. However, there is still a lack of successful PPP projects in municipal services, which may create discomfort for international investors.

This may reflect a general reluctance to adopt a more proactive approach to PPP in municipal services, including: developing a pipeline of pilot projects for PPP in municipal

services (including DH); addressing the inevitable conflict between affordability concerns and financial viability through structured, performance-based subsidies; and seeking international inspiration or assistance for transaction structuring of the pilot projects. Furthermore, the legal framework in Bosnia and Herzegovina is complex due to the country's administrative structures, and in Mongolia the responsibility for PPP has shifted between three ministries over five years, presenting a risk to continuity.

Table 2 provides an overview of the legal and institutional framework for PPP in the six countries, followed by brief comments on each country.

Table 2. Overview of Legal and Institutional Framework for PPP

Country		Legal Framework for PPP	Entry into Force / Last Revision	Lead Agency	Responsible Ministry
Bosnia and Herzegovina	Bosnia and Herzegovina	Concession Law of Bosnia and Herzegovina	2002/04	Commission for Concessions of Bosnia and Herzegovina	Reports to the Council of Ministers
	Federation of Bosnia and Herzegovina	Concession Law of the Federation of Bosnia and Herzegovina Cantonal Concession Laws Cantonal PPP Laws	2002/06	Commission for Concessions of the Federation of Bosnia and Herzegovina	Reports to the Cabinet
	Republika Srpska	Concession Law of Republika Srpska PPP Law of Republika Srpska	2002/13 2009/11	Commission for Concessions of Republika Srpska Ministry of Finance	Reports to National Assembly Ministry of Finance
Croatia		Concession Law PPP Law	2012 2012/14	Commission for Concessions Agency for Investment and Competition	Ministry of Finance
Kosovo		PPP Law	2011	PPP Department	Ministry of Finance
Mongolia		Concession Law	2010/12	Department responsible for PPP	Ministry of Finance ¹
Serbia		PPP Law	2011	PPP Commission	Ministry of Finance
Ukraine		PPP Law Lease and Concession Law	2010 2010	Ministry of Economy and Trade	Ministry of Economy and Trade

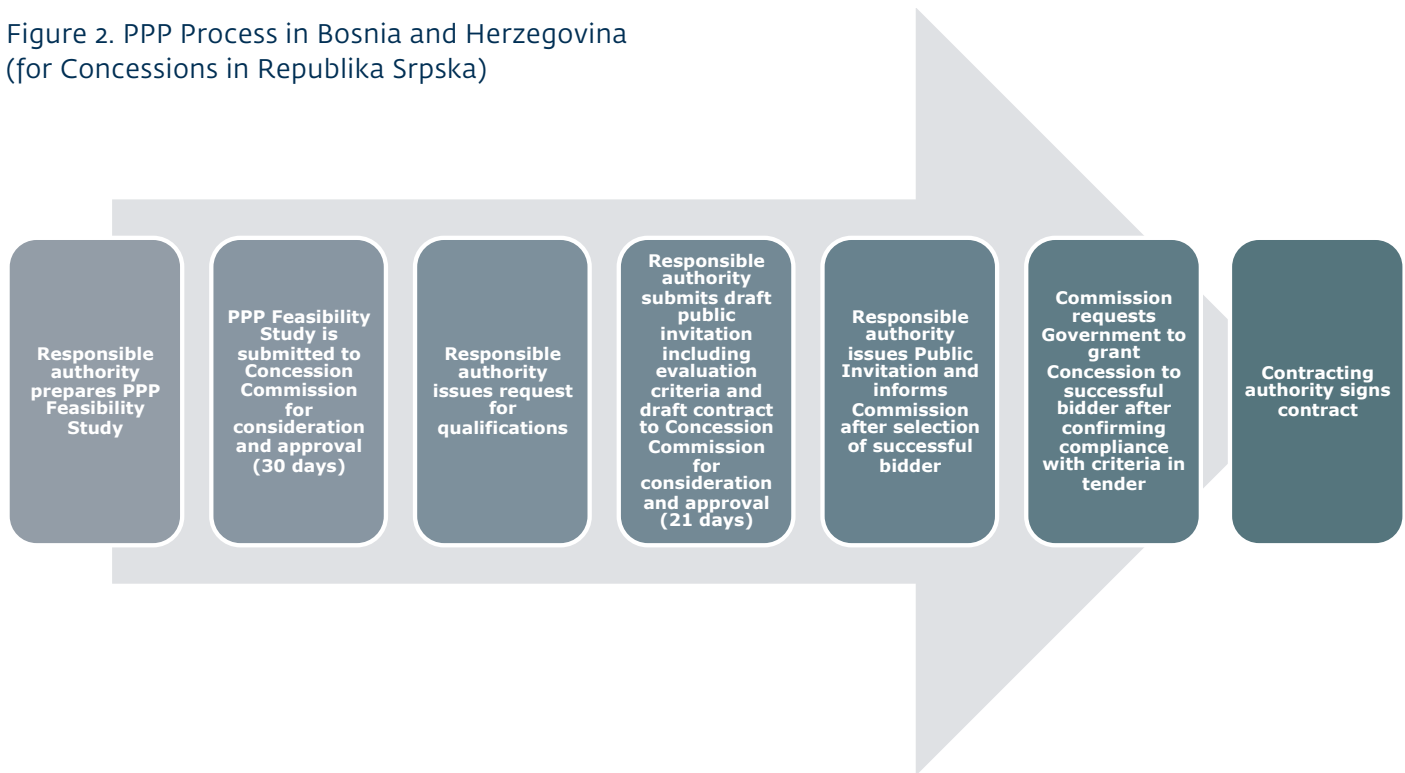
¹ The Department for Innovation and PPP under the Ministry of Economic Development is the lead agency on PPP in Mongolia. The department was formerly the PPP and Concession Department under the State Property Committee and will, under an ongoing reorganization, become part of the Ministry of Finance.

BOSNIA AND HERZEGOVINA

Due to the complex administrative structure of the country, separate concession laws exist at the state, federal, and canton levels. Similarly, four separate concession commissions operate at the state level and in three entities (the Federation of Bosnia and Herzegovina, Republika Srpska, and District Brcko). In addition to concession laws, both Republika Srpska and District Brcko have adopted PPP laws, and the Federation of Bosnia and Herzegovina is planning to adopt one in early 2016. There is no PPP law on the national level. The result is a rather complex system of concession/PPP regulation, with scattered responsibilities across a number of authorities. Existing concessions are mainly in the mineral extraction

sector and in power production (hydropower plants). The PPP project development, procurement, and award process in Republika Srpska is illustrated in Figure 2.

Figure 2. PPP Process in Bosnia and Herzegovina (for Concessions in Republika Srpska)



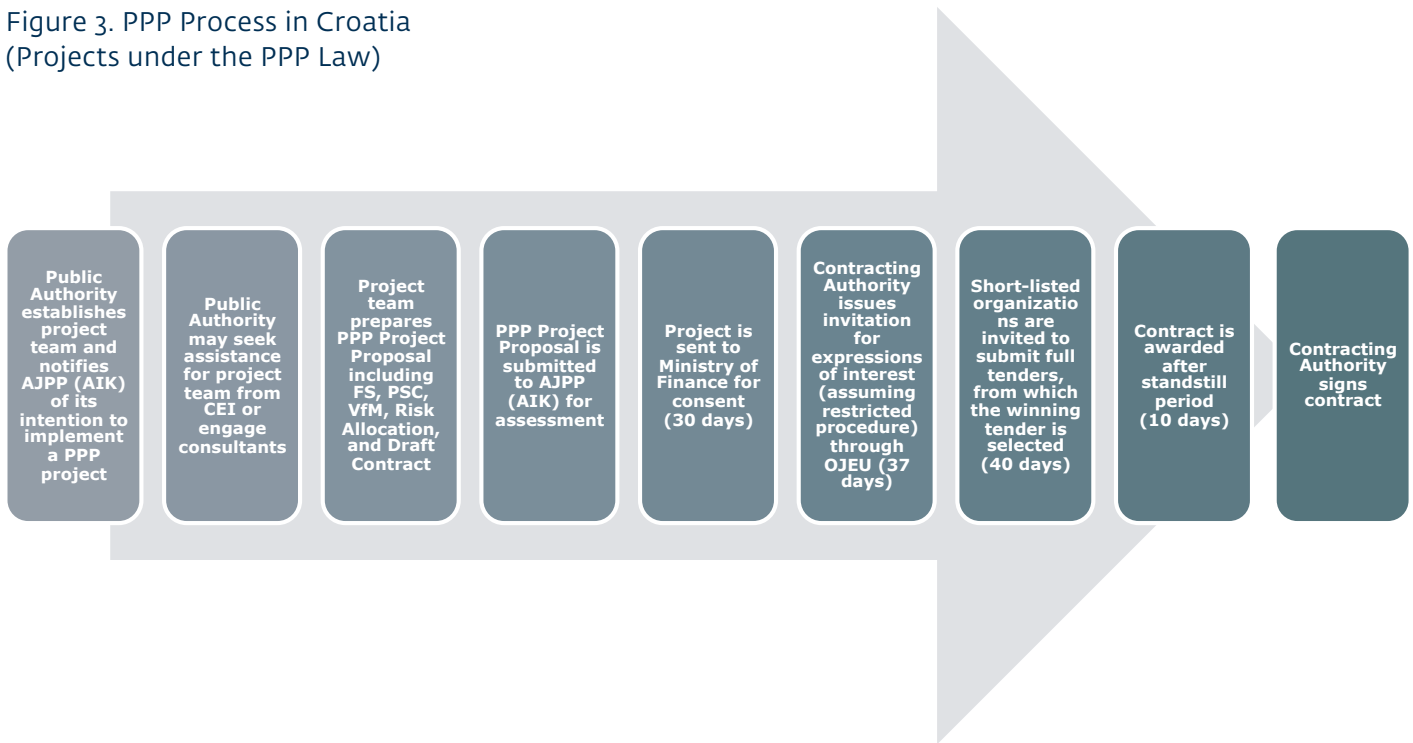
CROATIA

In Croatia, the new 2012 PPP Act is in compliance with international best practice. A central national agency for PPP (the Agency for Public-Private Partnership, AJPP), responsible for implementing the PPP Act, has been established (it recently merged with the Agency for Investment and Competition, AIK), and key guidance documents have been issued. Furthermore, an agency responsible for preparation and procurement of central government PPP projects (CEI) has been established and may provide assistance to procurement by local governments. Approval by AIK and the Ministry of Finance is required for all PPP projects, and, although the approval procedure has been simplified, the documentation requirements (including preparation of a

Public Sector Comparator) may present a barrier for projects that are the first PPP project in their sector. The parallel 2012 Concession Act includes less-stringent documentation and approval requirements, and the boundary between concessions and PPPs is determined on a case-by-case basis.

Croatia already has implemented a number of PPP projects, and several additional projects are under procurement or in the pipeline. Apart from the Zagreb airport, all recent projects are in the building sector. However, AIK and CEI expect that there may be significant potential for PPP projects in the municipal sector. The PPP project development, procurement, and award process in Croatia is illustrated in Figure 3.

Figure 3. PPP Process in Croatia (Projects under the PPP Law)

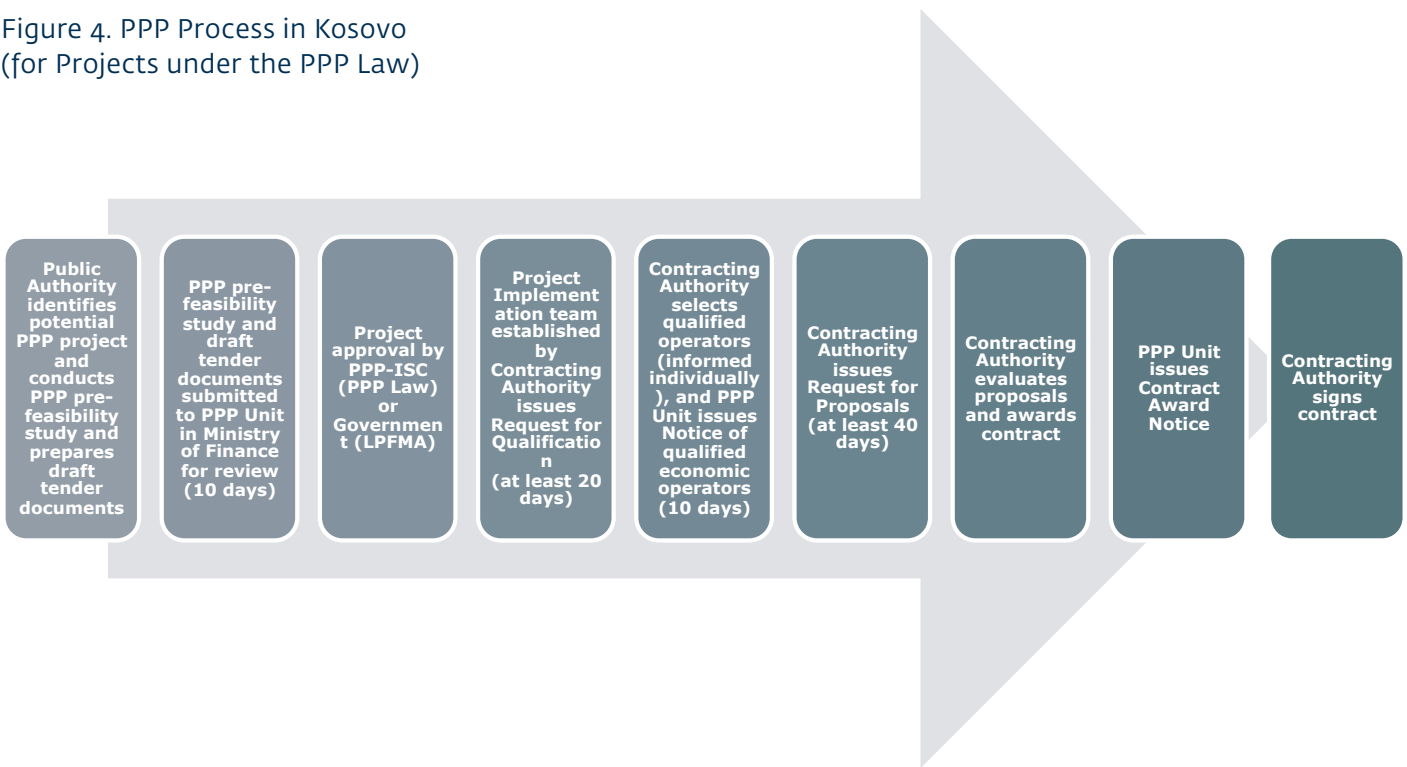


KOSOVO

The PPP framework in Kosovo is in accordance with international best practice, but only limited implementation experience exists today. A few successful PPPs exist in other sectors (airport, waste collection), and some pilots are under way in transportation (public buses) and education (schools). With respect to PPP in the municipal sector, the law allows it, the regulatory structure is in place, and the government officially supports it. However, the sector is sensitive due to social concerns, and there is limited municipal capacity for managing PPPs; for DH, there are serious issues related to revenue collection and financial viability that should be resolved prior to private investors being brought in.

Independent power production (IPP) is outside the PPP law and is overseen by the energy sector regulator. The PPP project development, procurement, and award process in Kosovo is illustrated in Figure 4.

Figure 4. PPP Process in Kosovo
(for Projects under the PPP Law)

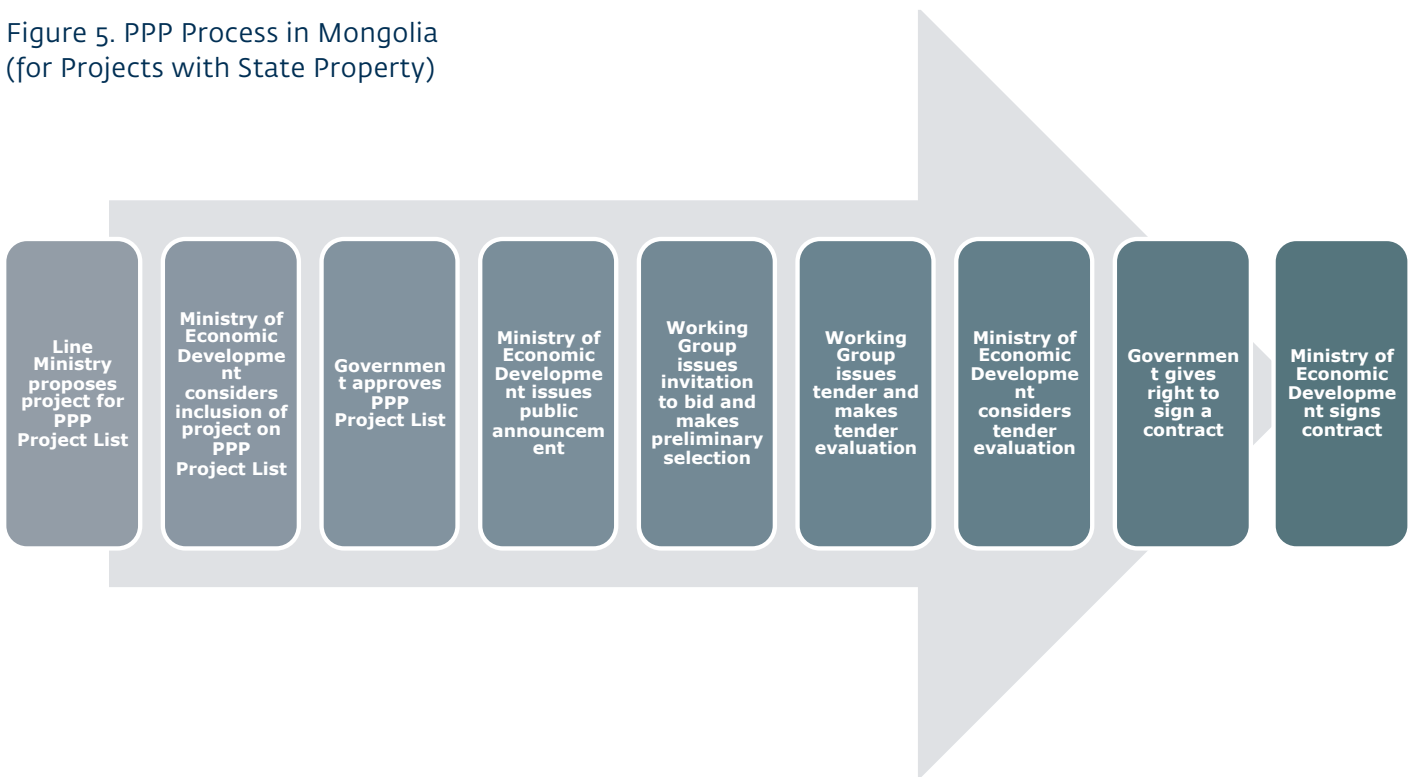


MONGOLIA

In Mongolia, the 2010 concession law is in accordance with international best practice. Model tender documents subsequently have been published, and a list of priority PPP projects has been approved by the government. However, there is very limited implementation experience, with one road project for access to a mining area reaching financial close and one CHP project (CHP-5 in Ulaanbaatar) still under negotiation. Prior to a recent change to the Ministry of Finance, the lead agency for PPP has had limited capacity to support the development and implementation of PPP transactions, and frequent changes in the institutional

location of the lead agency may have limited continuity in its work. The PPP project development, procurement, and award process in Mongolia is illustrated in Figure 5.

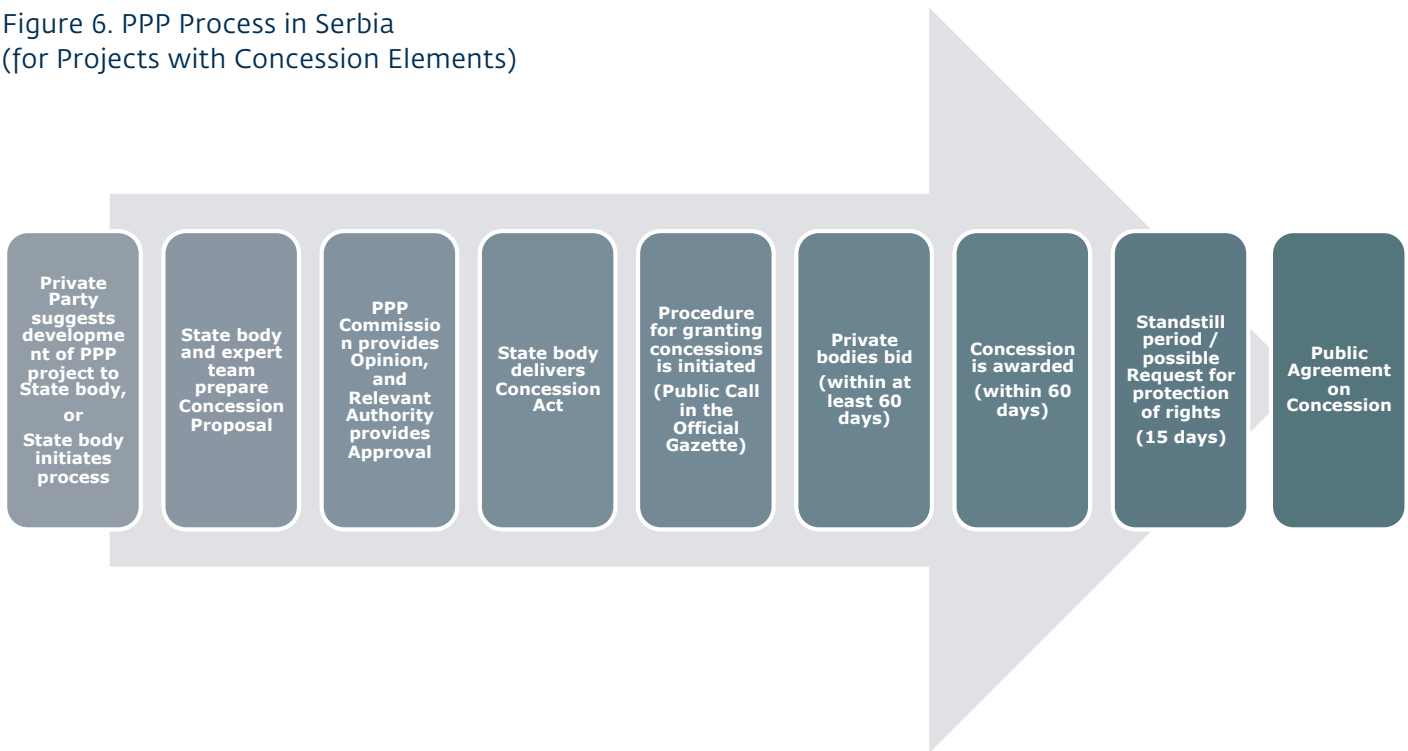
Figure 5. PPP Process in Mongolia (for Projects with State Property)



SERBIA

In Serbia, the new 2011 PPP law is in compliance with international best practice. A PPP unit has been established in the Ministry of Finance, a practical guide and template Heads of Agreement has been published, and the PPP unit has provided positive opinion on 21 new PPP projects, including two small heating projects. However, there is a general lack of successfully implemented PPP projects to date, and three smaller-scale projects in the DH sector failed due to inadequate cost recovery, as cost-covering tariffs were not implemented and the assets were reverted to the municipalities. The PPP project development, procurement, and award process in Serbia is illustrated in Figure 6.

Figure 6. PPP Process in Serbia
(for Projects with Concession Elements)



UKRAINE

In Ukraine, the existing PPP Law (under revision) has a number of challenges when compared to international best practice, as it introduces an additional layer of regulation by referring to other laws for rules and regulations, rather than asserting the prevailing force of its own provisions. This complication challenges potential investors to refer to legislative acts, which are contradictory in specific cases. Moreover, several different bodies are involved in the preparation and implementation of PPPs, as the PPP Law requests various decisions and approvals of responsible authorities at the local or state level. This complexity is an obstacle for the smooth implementation of PPPs. No PPP projects have been implemented under the PPP Law

in Ukraine, but a number of PPP-type projects have been implemented under the less-restrictive concession law. The PPP project development, procurement, and award process in Ukraine is illustrated in Figure 7.

Figure 7. PPP Process in Ukraine
(for Projects under PPP Framework Law)



2.2 Legal and Institutional Framework for the DH Sector

Table 3 provides an overview of the legal and institutional framework for the DH sector in the six countries.

BOSNIA AND HERZEGOVINA

In general, the state level in Bosnia and Herzegovina has very limited competences in the energy sector, resulting in a scattered regulatory framework for the DH sector, specific to each subnational entity. The most commonly used laws for regulation of DH companies are the Law on Communal Activities and the Law on Local Self-Governance.

The Law on Energy in Republika Srpska does not explicitly include heat energy, and a separate Law on Heat Energy is in the preparation stage in the Federation of Bosnia and Herzegovina. No DH sector strategy exists on any level.

Ownership of the DH companies rests with the cantons and municipalities. The tariff methodology is established at the canton and municipal levels, and tariffs are calculated and approved by cantons and municipalities. Subsidies to DH companies and direct household subsidies also are allocated at the canton and municipal levels. The heating sector in Bosnia and Herzegovina is illustrated in Figure 8 (for Zenica DH in the Federation of Bosnia and Herzegovina).

Figure 8. The Heating Sector in Bosnia and Herzegovina
Zenica District Heating Company Example of Heating Sector in FBiH

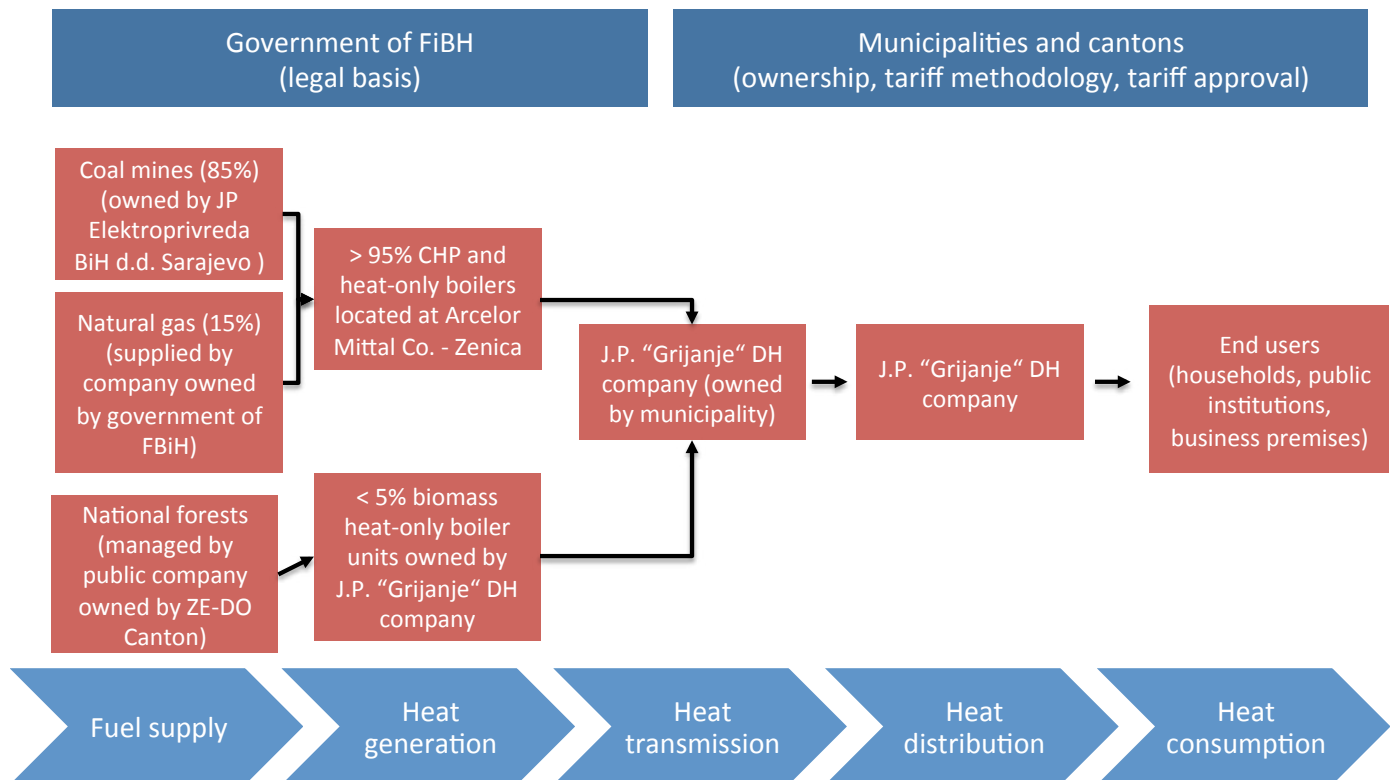


Table 3. Overview of Legal and Institutional Framework for the DH Sector

Country	Key Legal Basis for DH	Responsible Ministry	Energy Sector Regulator
Bosnia and Herzegovina	Bosnia and Herzegovina		State Electricity Regulatory Commission ¹
	Federation of Bosnia and Herzegovina	Law on Use of Renewable Energy Sources and Efficient Cogeneration, Federation of Bosnia and Herzegovina (2013/14)	Ministry of Energy, Mining, and Industry
	Republika Srpska	Energy Strategy of Republika Srpska up to 2030 Law on Energy of Republika Srpska (2009) Law on Energy Efficiency of Republika Srpska (2013) Law on Renewable Energy Sources and Efficient Cogeneration, Republika Srpska (2013)	Ministry of Administration and Self-Governance Ministry for Spatial Planning, Civil Engineering, and Ecology
Croatia	Energy Development Strategy for Croatia (2009) ⁴ Energy Act (2012/14) Act on Heat Energy Market (2013/14) Act on Regulation of Energy Activities (2012)	Ministry of Economy	HERA (Croatian Energy Regulation Agency)
Kosovo	Law on Energy (2010) Law on Energy Regulator (2010) Law on Central Heating (under revision)	Ministry of Economic Development	Energy Regulatory Office (ERO)
Mongolia	Energy Law (2001) Energy Sector Development Strategy (2002) Renewable Energy Law (2007) State Policy on Fuel and Energy (2008)	Ministry of Energy ⁵	Energy Regulatory Commission (ERC)
Serbia	Energy Law (2011/13/14) Law on the Efficient Use of Energy (2013)	Ministry of Energy and Mining ⁶	Energy Agency of the Republic of Serbia (AERS) ⁷
Ukraine	Law on Heat Supply (2005) Law on Housing and Communal Services (2004)	Ministry of Regional Development, Construction, and Housing and Communal Services	National Energy and Communal Services Regulatory Commission

1 Jurisdiction is limited to international energy trade and transmission and transmission system operation, including regulation of transmission tariffs.

2 No regulatory oversight of DH sector

3 No regulatory oversight of DH sector

4 In connection with its EU accession on July 1, 2013, Croatia has transposed the EU regulations into its national legislature. This concerns in particular the implementation of the so-called Third Energy Package whose objectives include stronger market competition and liquidity, improvement of network infrastructure operation, security of supply, customers' active role and protection, as well as promotion of renewable energy sources.

5 Presently being merged with the Ministry of Mining

6 After the transfer of responsibility for the DH sector from the Ministry of Public Administration and Local Self-Government

7 The DH sector is a municipal responsibility, but the role of the regulator has increased with the new energy law at the end of 2014.

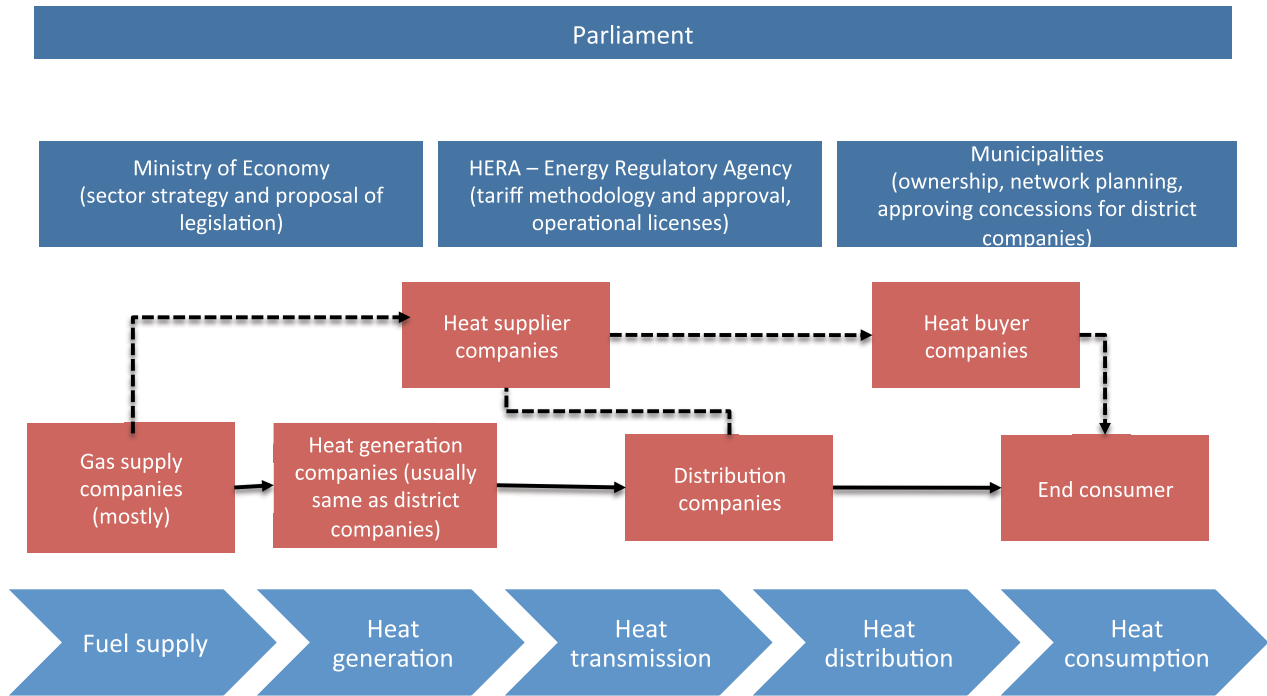
CROATIA

In Croatia, the accession to the European Union as of July 1, 2013 has been instrumental in a comprehensive revision of energy sector legislation in recent years, including harmonization of legislation with the Third Energy Package. The Third Energy Package's objectives include stronger market competition, and it foresees an unbundling of the heat sector, which, in principle, would enable third-party access. Only HEP and Energo Rijeka own and operate CHP plants, but most DH companies own local/isolated boilers that provide heating for nearby buildings. The DH distribution companies own the network. Substations and pump stations are owned either by the DH distribution companies or by the end-buyers of heating energy. The building owners oversee hot tap water installations and internal building installations. The municipalities issue concessions for the DH distribution

network, usually own the DH companies (apart from HEP), and plan and approve DH network development.

HERA was established in 2004 as an independent regulator with a broad mandate that includes designing heat tariff methodologies and approving heat tariffs proposed by the DH companies. New tariff methodologies have been implemented recently, and the first tariff decisions have been made for a number of smaller DH systems. This led to tariff increases, which improved the financial viability of DH utilities, taking an important step toward realistic cost-reflective heat energy tariffs. HEP DH, which accounts for 80 percent of the sector, had not yet applied a new tariff methodology at the time of preparation of this report. The heating sector in Croatia is illustrated in Figure 9 (with potential third-party access illustrated in dotted lines).

Figure 9. The Heating Sector in Croatia



Heating and other energy sectors in Croatia are liberalized in line with the Third Energy Package and other relevant EU Directives

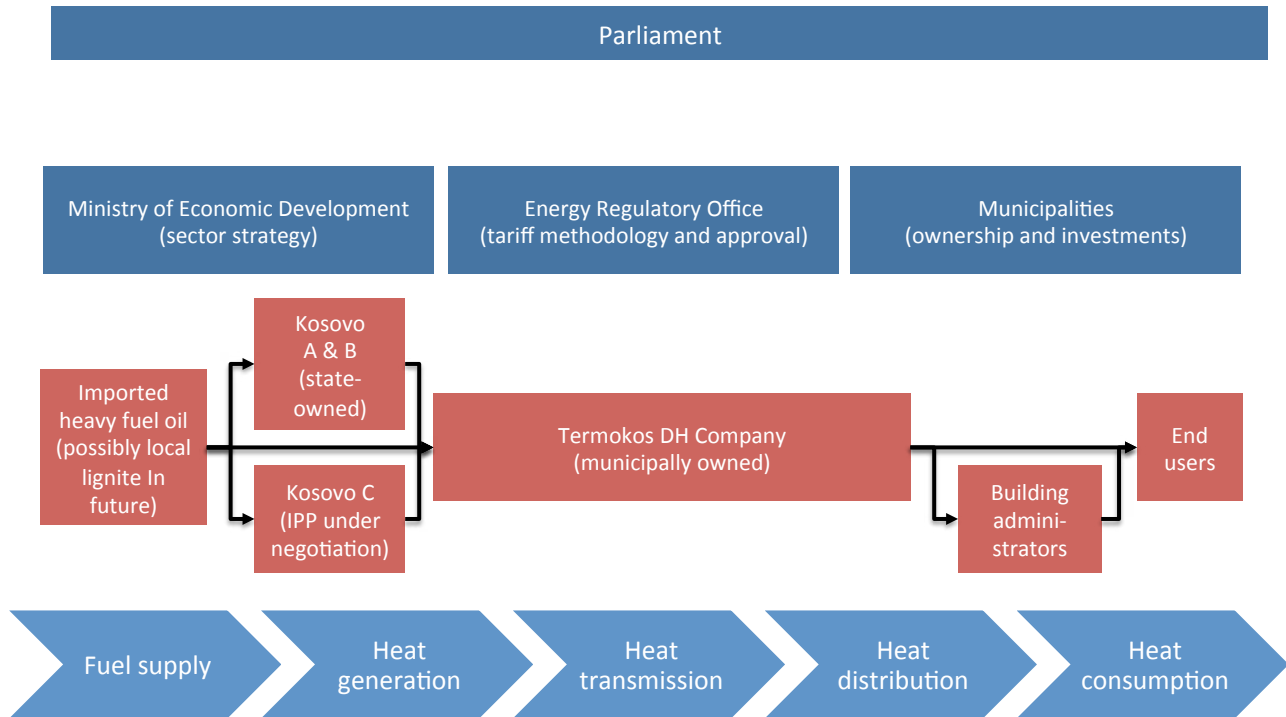
Dotted lines mark commercial transactions, not physical energy flow

KOSOVO

The Law on Energy established ERO as an independent regulator responsible for defining the electricity and heat tariff methodology, approving electricity and heat tariffs, and awarding licenses for independent power production. Municipal ownership of the DH companies and political concerns about affordability, however, seem to prevent tariffs from reaching cost-recovery levels. The sector is burdened by the high costs of imported fuel. In spite of subsidies, the companies frequently lack funding for fuel and run at low operational levels, with many off days during the heating season, which results in low credibility and low revenue collection. A new 2014 law enabling the blocking of bank accounts in case of non-payment and improved court processes is apparently helping significantly. The heating sector in Kosovo is illustrated in Figure 10 for the municipally

owned Termokos DH in Pristina, which buys heat from the state-owned Kosovo A&B and possibly from a future Kosovo C, for which an IPP agreement is under negotiation.

Figure 10. The Heating Sector in Kosovo

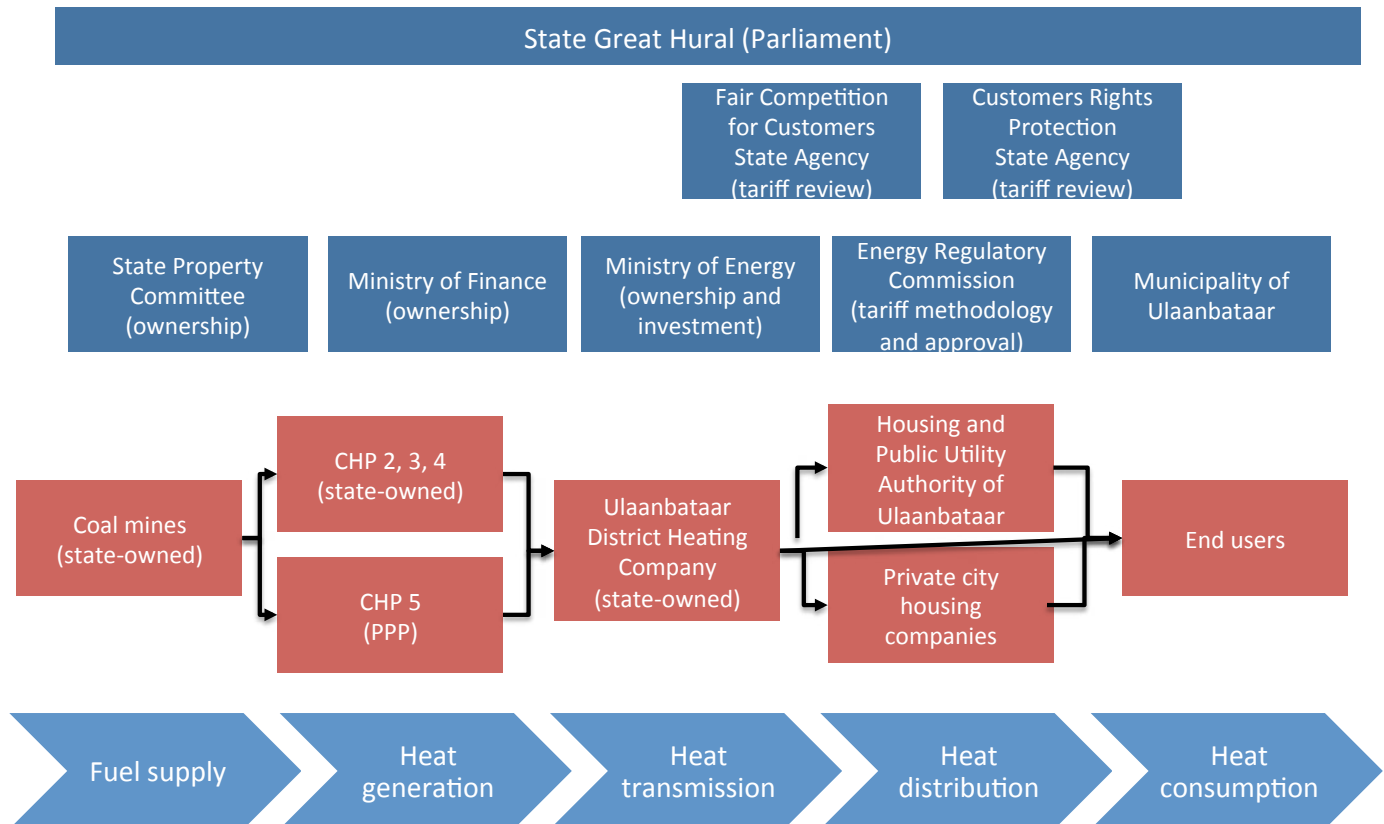


MONGOLIA

In Mongolia, the 2001 Energy Law introduced ambitious unbundling of the electricity and heat sector, but state ownership is retained for heat generation, transmission, and distribution from the substation to end-users (outside new development areas). DH is the preferred form of heating in Mongolia, with DH networks covering most major urban centers. The sector is characterized by significant fuel subsidies (domestic coal is provided at production cost) and cross-subsidization (between electricity and heat generation

as well as between commercial and household heat customers). The incentive for switching users to metered billing (and thereby the promotion of end-user energy efficiency) is currently limited. The heating sector in Mongolia is illustrated in Figure 11 for the state-owned Ulaanbaatar DH company, which buys heat from the state-owned CHP 2, 3, and 4 plants and possibly from a new CHP 5 plant to be implemented as a PPP project.

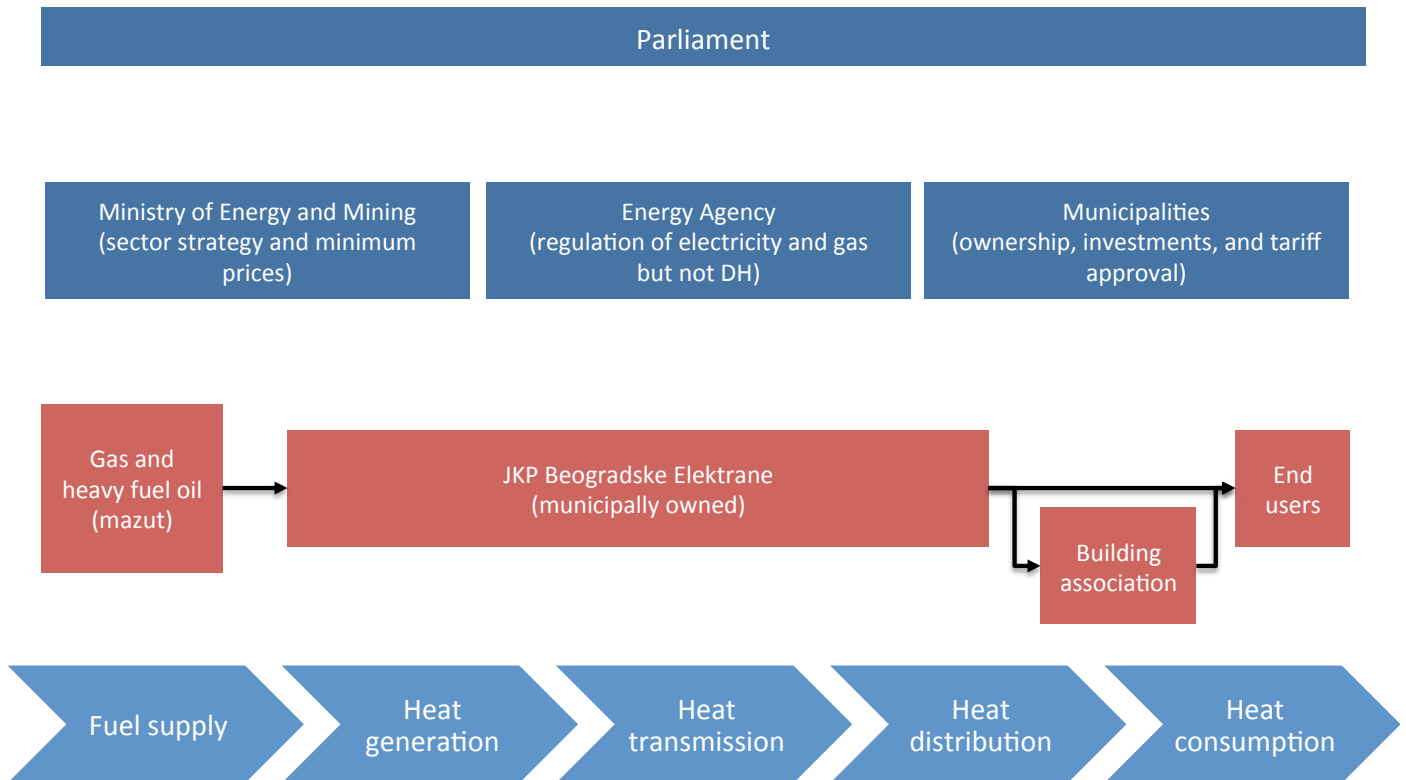
Figure 11. The Heating Sector in Mongolia



SERBIA

In Serbia, the Ministry of Energy and Mining has taken over responsibility for the DH sector, which is now covered in the Energy Strategy. The regulator will define a common methodology for tariffs, but municipalities still approve heat tariffs. The Law on Energy includes feed-in tariffs for electricity produced by CHP, renewable energy sources, and waste incineration; renewable-based heat-only generation is not covered under the Law. The heating sector in Serbia is illustrated in Figure 12 for the municipally owned Belgrade DK company, which encompass both heat generation and distribution.

Figure 12. Belgrade District Heating Company
Example of The Heating Sector in Serbia

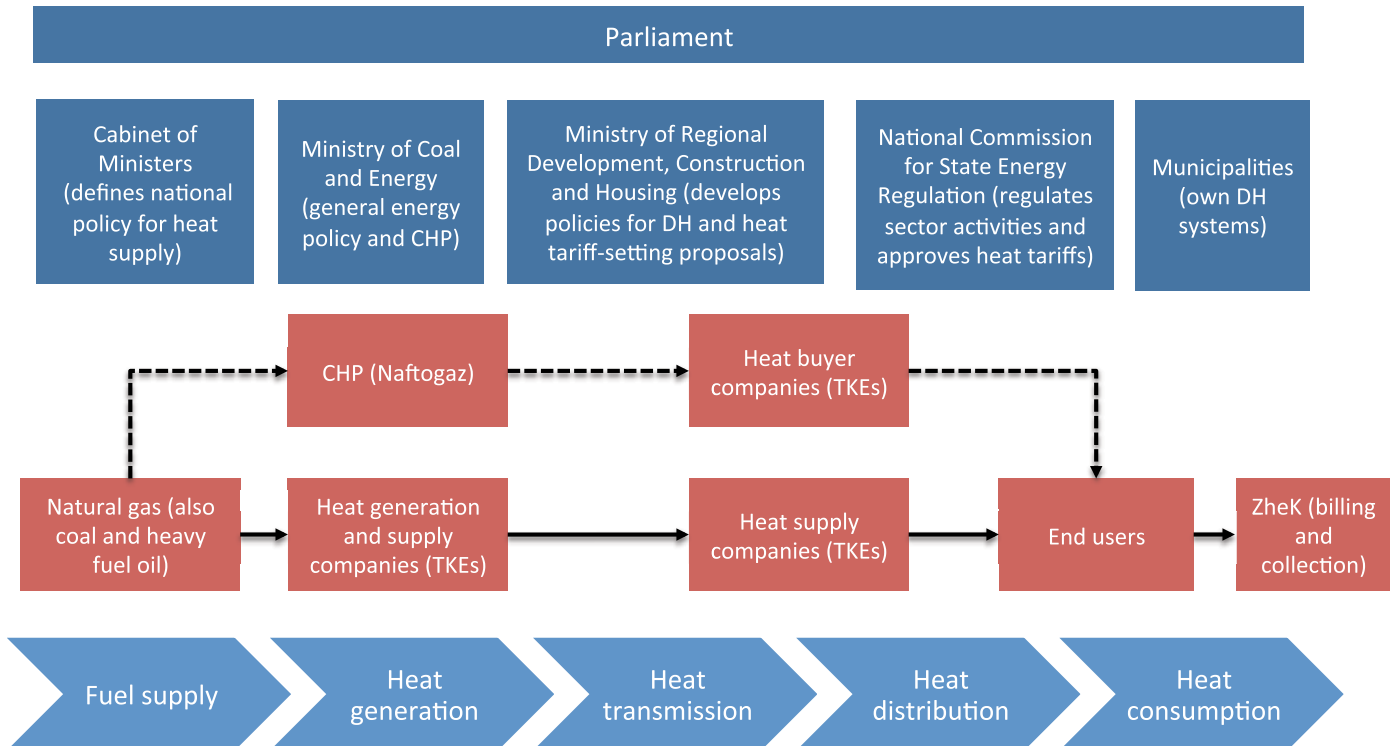


UKRAINE

In Ukraine, the Law on Heat Supply establishes legal, economic, and organizational grounds in the sphere of heat supply. It regulates relations concerning production, transportation, supply, and management of thermal energy, with a view toward improving the energy security of Ukraine, increasing the energy efficiency of thermal energy supply systems, and protecting consumer rights related to thermal energy supply. In addition, the Law on Housing and Communal Services regulates the terms and conditions of housing and utility service agreements, the fundamentals of tariff regulation, and a few types of classification of housing and communal services.

Local heat supply companies (TKEs), usually owned and managed by local governments and municipalities, operate the DH plants and distribution networks. TKEs buy gas, coal, and heavy fuel oil to produce heat at their own plants, or they may purchase heat from CHP plants belonging to others, which they supply to final consumers. The heating sector in Ukraine is illustrated in Figure 13 (with heat purchase from an external CHP shown in the dotted line).

Figure 13. The Heating Sector in Ukraine



ROLE OF REGULATOR

Table 4 provides an overview of the role of the sector regulator in the six countries.

Table 4. The Role of the Regulator

Country	Role of Sector Regulator
Bosnia and Herzegovina	Regulation of electricity generation, distribution, and supply is implemented by separate entities; however, none of these entities have regulatory oversight of the DH sector. The regulation of DH is in practice exercised through municipal/canton ownership in accordance with the responsibilities allocated to them by laws on local self-governance.
Croatia	The regulator establishes heat tariff methodologies (without setting the specific tariff levels) and approves the tariffs proposed by the DH companies. The regulator issues licenses for carrying out energy activities and rulings on granting the status of eligible producers. Note that heat and electricity generation are commercial activities rather than public services, in contrast to where a concession is given. Independent heat and/or power production would require an authorization from the Ministry of Economy as well as a production license from the regulator.
Kosovo	The regulator grants licenses, establishes heat tariff methodologies, and approves tariffs for regulated energy services. The regulator also grants permits for the construction and operation of new generation capacity. The regulator prescribes the general conditions for energy supply and the standards of service to be met by the licensees, and resolves disputes among customers and energy enterprises, system operators, and energy enterprises, as well as between generators. Furthermore, the regulator issues general acts, individual acts, and secondary legislation in accordance with the Law on Energy Regulation; revises, approves, and controls compliance with all codes (including the grid and distribution code) as well as all technical rules; enforces the provision of the Law on Energy Regulation; and imposes fines for violations.
Mongolia	The regulator sets the terms and conditions to obtain a license, issues licenses, establishes the methodology to determine heat tariffs, defines the structure of tariffs, and reviews, approves, and publishes tariffs of licensees.
Serbia	The regulator approves prices for electricity and gas and is responsible for the grid code. The DH sector is a municipal responsibility, but in general the role of the regulator is expected to increase with the opening of the natural gas market and increased focus on renewable energy. The local assembly will, however, still have the final approval responsibility for tariffs, and municipalities will retain operational responsibility for the DH sector.
Ukraine	In August 2014, a National Energy and Communal Services Regulatory Commission (NECSRC) was established as an independent regulator for the larger DH utilities, and it presently regulates the 227 largest DH utilities. NECSRC's main responsibilities include issuing licenses and regulating tariffs for generation, transmission, and supply of heating and hot water supply services. In addition, the regulator is responsible for approving the investment programs of utilities, monitoring them through review of their annual and quarterly reports, and controlling compliance with the license conditions. NECSRC's current work program includes increasing all of the mentioned tariffs to a full cost-recovery level and eliminating cross subsidies among the public, budget organizations, and other customers. However, NECSRC is in a challenging position because of the significant increase in natural gas prices, the non-cost-recovery tariffs of DH utilities for the public, and the reduced affordability for end-users due to the current political situation in Ukraine. One of NECSRC's current priorities is to stimulate utilities to switch to alternative fuels and reduce gas dependence.

Table 5. Ownership and Tariff Approval

Country	Ownership of DH Utilities	Tariff Methodology Established by	Tariffs Approved by
Bosnia and Herzegovina	Municipalities/cantons	Municipalities/cantons	Municipalities/cantons
Croatia	State (HEP), municipalities, and partly private (Rijeka)	Croatian Energy Regulation Agency (HERA)	Croatian Energy Regulation Agency (HERA)
Kosovo	Municipalities	Energy Regulatory Office (ERO)	Energy Regulatory Office (ERO)
Mongolia	Jointly by State Property Committee, Ministry of Finance, and Ministry of Energy	Energy Regulatory Commission (ERC)	Energy Regulatory Commission (ERC)
Serbia	Municipalities	Municipalities, but a common tariff methodology will be part of the new Energy Law	Municipalities
Ukraine	Municipalities (some under private lease-type contracts)	National Energy and Communal Services Regulatory Commission	National Energy and Communal Services Regulatory Commission or local self-governments

OWNERSHIP AND TARIFF APPROVAL

Table 5 provides an overview of the ownership of DH utilities and the responsibilities for establishing tariff methodologies and approving tariffs in the DH sector.

In Bosnia and Herzegovina and in Serbia, regulatory responsibility for the DH sector is not separated from the ownership of DH utilities, whereas in the other three countries there is greater separation. In Serbia, this will change following the recent revision of the Energy Law.

HEAT TARIFFS

Table 6 provides an overview of the present heat tariffs for unmetered and metered, household and commercial customers in the six countries (standardized to U.S. dollars for comparison). Because the tariffs vary from city to city in most countries, the table shows representative large cities for comparison.

With the different tariff structures across the six countries, immediate comparison may be difficult. Figure 14 therefore

uses the gross revenues per DH customer as a proxy for the tariff levels to illustrate regional and national differences in the tariff level.

Note that Serbia and Croatia have the highest revenue basis per household, whereas Ukraine and Mongolia have the lowest.

Table 6. Overview of Heat Tariffs

Heat Tariff	Serbia (Belgrade)	Kosovo (Pristina)	Croatia (Zagreb)	Bosnia and Herzegovina (Sarajevo)	Mongolia (Ulaanbaatar)	Ukraine (Kharkiv)
Unmetered household tariff	\$1.18/m ² /month + \$32.3/kW/year	\$0.84/m ² /month	Tariffs are the same as for metered but measured at the substation and divided proportionally to m ² .	\$0.80/m ² /month	\$0.21/m ² /month	\$0.30/m ² /month (subsequently increased on April 1 2015)
Unmetered commercial tariff	N/A	\$1.25/m ² /month		\$2.7/m ² /month	\$0.20/m ² /month	N/A
Metered household tariff	\$70.7/MWh + \$0.42/m ² /month	\$56.9/MWh + \$0.83/kW/month	\$27.7/MWh (consumption) + \$11.20/kW/year (capacity) + \$13.70/year + \$0.98/m ² /year (fixed element)	\$47.0/MWh + \$0.32/m ² /month	\$6.1/MWh	\$17.0/MWh
Metered commercial tariff	\$86.5/MWh	\$56.9/MWh + \$0.83/kW per month	\$62.7/MWh + \$23.5/kW/year + \$13.7/year + \$0.98/m ² /year	\$50.0/MWh + \$0.63/m ² /month	\$13.0/MWh	\$53.0/MWh
Note:	Incl. 10% VAT	Excl. 16% VAT	Excl. 25% VAT	Excl. 17% VAT	Excl. 10% VAT	Excl. 20% VAT

Figure 14. Regional and National Differences in Tariff Levels

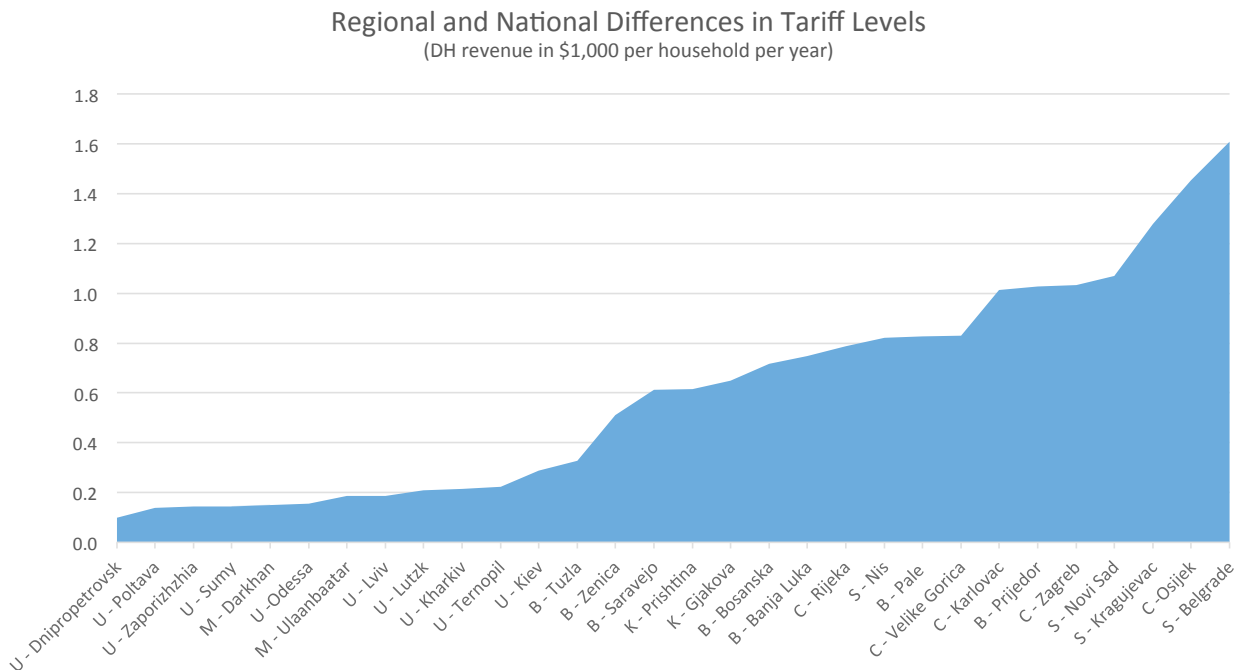


Table 7. Overview of Support Mechanisms

Country	Financial and Fiscal Support Mechanisms	Regulatory Mechanisms	Interconnection Policies
Bosnia and Herzegovina	Feed-in tariffs for electricity from renewables and cogeneration (Federation of Bosnia and Herzegovina and Republika Srpska)	None	Priority access and dispatching incentive foreseen (Federation of Bosnia and Herzegovina and Republika Srpska)
Croatia	Feed-in tariffs for electricity from renewables and cogeneration	Requirement for all new thermal electricity generation above 20 MW to allow for recovery of heat by means of a high-efficiency cogeneration unit to be sited where waste heat can be used (Article 10 of Energy Efficiency Directive). Guarantee of origin for electricity. Preferred energy generator status (access to feed-in tariffs).	Equal access to all generators
Kosovo	Feed-in tariffs for electricity from renewables and cogeneration. Law foresees similar incentives for heat production.	Certificate of Origin for electricity from renewables and CHP	Connection, purchasing, and dispatching priority for renewable and CHP electricity and heat
Mongolia	Feed-in tariffs for electricity from renewables	None	Preferential access for electricity from renewables.
Serbia	Feed-in tariffs for electricity from renewables and cogeneration. The new energy law foresees similar incentives for heat production (Article 62).	Privileged electricity producers (access to feed-in tariffs and not paying balancing service). The new energy law foresees similar incentives for heat (Articles 57–58 and 365–366).	Privileged producers have preferential access
Ukraine	Feed-in tariffs for electricity from renewables and cogeneration	None	Equal access to all generators

SUPPORT MECHANISMS FOR DH/CHP

With regard to financial support mechanisms, all six countries have feed-in tariffs for the CHP electricity that is exported to the grid, but none of the countries have implemented specific feed-in tariffs for heat production from cogeneration or renewable sources. The incentives are backed in all countries by interconnection policies that provide CHP and renewables with transparent and consistent interconnection procedures for selling the generated electricity to the grid. Some countries also have market-based mechanisms (such as a requirement for new capacity to be CHP, status of privileged producer, and Certificates of Origin).

Table 7 provides an overview of the support mechanisms.

FEED-IN TARIFFS FOR RENEWABLE ENERGY

Table 8 provides an overview of the feed-in tariffs for renewable energy.

Table 8. Overview of Feed-in Tariffs for Renewable Energy

Feed-in tariffs (U.S. cents/ kWh)	Serbia	Kosovo	Bosnia and Herzegovina	Croatia	Mongolia	Ukraine
CHP (coal)	10.1	N/A	5.6–13.5 (RS) 9.8 (FBiH)	8.6	Negotiated	N/A
CHP (gas)	11.1	N/A	5.6–13.5 (RS) 9.8 (FBiH)	8.6	N/A	N/A
Biomass	16.3–20.7	8.9	14.5–15.5 (RS) 14.5–20.0 (FBiH)	8.6–21.2	Negotiated	13.2
Geothermal	8.7–12.1	N/A	N/A	19.6	Negotiated	N/A
Hydro	9.3–15.5	7.9	8.0–9.9 (RS) 7.9–18.5 (FBiH)	8.6–17.4	4.5–6.0	8.2
Solar PV	20.3–25.8	NA	13.0–20.0 (RS) 9.4–23.7 (FBiH)	25.0–31.0	15.0–18.0	45.3–49.4
Wind	11.5	10.6	10.6 (RS) 9.4–23.7 (FBiH)	8.6	8.0–9.5	8.9–12.0
Waste	10.7	N/A	N/A	8.6–21.8	N/A	N/A
Duration of feed-in tariffs (years)	12	10	12	14	10	5

Note: RS = Republika Srpska; FBiH = Federation of Bosnia and Herzegovina

Table 9. Assessment of the Institutional and Regulatory Framework

International Best Practice	Serbia	Kosovo	Croatia	Bosnia and Herzegovina	Mongolia	Ukraine
Regulators should be independent from ownership and management	Partly	Yes	Yes	Partly	Yes	Yes
Regulatory and tariff approval process should be transparent and documented	Partly	Yes	Yes	Partly	Partly	Partly
The approved tariffs should allow investors to cover full costs	Partly	Partly	Partly	Partly	Partly	Partly
Regulation should provide incentives for efficiency improvements	Partly	Partly	Yes	Partly	Partly	Partly
Policy instruments are used to support the use of DH/CHP (financial and fiscal support mechanisms, market-based mechanisms, interconnection policies)	Yes	Yes	Yes	Yes	Partly	Yes
Social protection of DH customers against price increases should explicitly target low-income households	Partly	Partly	Partly	Partly	Partly	Partly
Investment decisions consider the interests of consumers (by promoting low-cost, reliable heat supply)	Yes	Yes	Yes	Partly	Yes	Partly
Legislative framework allows for private sector participation in the DH sector	Yes	Yes	Yes	Yes	Yes	Yes

2.3 Assessment of the Institutional and Regulatory Framework

Table 9 compares the institutional and regulatory framework in the six countries to international best practice on facilitating private sector investment in CHP/DH (see Section 3 for further discussion).

Note that the key issues across all six countries concern implementation rather than inadequate regulations:

- ▶ Although most regulators are independent and the tariff methodologies allow for cost recovery, social concerns remain a significant determinant in proposing and approving DH tariffs. This is because social protection programs targeted at low-income households tend to be less developed, and affordability concerns are addressed instead through low utility tariffs, which effectively act as blanket subsidies that benefit all connected households.
- ▶ The legislative framework in all six countries allows for private sector participation in the DH sector, but there is still a lack of successful PPP projects, which may create discomfort for international investors.

Furthermore, country-specific issues exist:

- ▶ In Bosnia and Herzegovina, complex administrative structures have resulted in a multitude of legal acts and regulatory bodies regulating PPP transactions as well as in a scattered legal framework related to the DH sector. Due to significant government decentralization, PPP and DH decision making is locally driven and differs substantially depending on the locality.
- ▶ In Mongolia, significant subsidies that permeate the entire value chain—from primary fuel supply and CHP generation, to transmission and distribution to the end-users—make partial sector reforms difficult.

2.4 Recommendations for Improving the Institutional and Regulatory Environment

The assessment of the institutional and regulatory framework above highlighted key challenges in the framework conditions for PSP in DH, including challenges related to the conflicting goals of financial viability of the DH sector and affordable heating for households, and to a lack of successfully implemented PPPs in the municipal sector.

The key recommendations for all countries to improve financial viability of the DH sector are:

- ▶ Tariff methodology determination and approval of tariffs should be separated from ownership (ideally with an independent national regulator);
- ▶ Affordability concerns should, in the longer term, be handled through targeted subsidies to the poorest, rather than through generally low tariffs; and
- ▶ In the transition phase, performance-based subsidies for utilities may be a solution.

Furthermore, the key recommendations for all six countries to enable testing of PSP in the DH sector are:

- ▶ Developing a pipeline of pilot projects for PPP in municipal services (including DH);
- ▶ Seeking international inspiration or assistance for transaction structuring of the pilot projects; and
- ▶ Addressing the inevitable conflict between affordability concerns and financial viability upfront, through structured, performance-based subsidies.

Table 10 (next page) provides country-specific recommendations on improvements in the institutional and regulatory framework in the six countries to facilitate private sector investment in the CHP/DH sector.

Table 10. Country-Specific Recommendations

Country	Key Recommendations
<p>Bosnia and Herzegovina</p>	<p>Due to complex administrative structures and a high degree of decentralization, a multitude of legal acts regulates PPP transactions. PPP models are split into different sets of acts and are regulated by different regulatory authorities. The legal space regulating PPPs needs internal harmonization, with key principles consolidated within a single document at the national and entity (Federation of Bosnia and Herzegovina and Republika Srpska) levels. The country should set clear and uniform PPP policy with regard to all PPP models and provide clear division of competences between PPP and other country legal acts (for example, Public Procurement Law). Establishing a single regulatory body in each entity for concessions and other forms of PPP is also recommended.</p> <p>The legal framework related to the DH sector is incomplete. The country lacks an Energy Strategy, a District Heating Sector Strategy, and a national legal document regulating key principles of the DH sector. A Law on Thermal Energy is in preparation in the Federation of Bosnia and Herzegovina; however, a more coherent framework regulating DH sector operation in both entities and at the national level needs to be established.</p> <p>In selected utilities, tariffs do not cover the costs of operation and investments, although the methodology formally allows inclusion of all costs. Concerns about affordability and social burden are frequently given as the reason for not adjusting tariffs to the proper level. There is a need for legal and regulatory enforcement of the tariff-setting and approval process. One option could be to establish a single regulator in each entity or ideally a national regulator. The methodology of tariff calculation also needs revision to take into account the need for substantial investment in DH infrastructure, and corresponding adjustments in the tariff-setting methodology.</p> <p>Various social assistance plans exist, but they are not uniformly applied. In some administrative units, funds are paid directly to customers, whereas in others they are allocated to the monthly invoice or to companies. Both entities need to revise their existing household social assistance plans to allow low-income families to receive direct targeted household subsidies. The program should be imposed uniformly across all municipalities and cantons.</p>

Country	Key Recommendations
<p>Croatia</p>	<p>Croatia has had some PPP experience, and several projects are under procurement or in the pipeline. Apart from the Zagreb airport, all recent projects are in the building sector. However, AIK (previously AJPP) and CEI expect that there may be significant potential for PPP projects in the municipal sector. It is recommended that AIK identify selected pilot projects in municipal sectors where a potential for PPP exists (for example, waste management, street lighting, and possibly DH) and that CEI provide project development assistance for the pilot projects to demonstrate the viability of PPP projects in municipal sectors and facilitate development of sector-specific tender and contract templates.</p> <p>Approval from AIK and the Ministry of Finance is required for all PPP projects, and although the approval procedure has been simplified, the documentation requirements may present a barrier for projects that are the first PPP project in their sector. The parallel 2012 Concession Act includes less-stringent documentation and approval requirements, and the boundary between concessions and PPPs is determined on a case-by-case basis. The risk of strategic representation of PPP-type concessions as not being of a PPP type in the context of the legislation (for example, to avoid the requirement for establishing a Public Sector Comparator) should be recognized. For smaller PPP-type concessions at the municipal level, it may be beneficial to relax upfront documentation requirements for first-of-a-kind projects or to provide central government funding for selected pilot projects to enable the development of templates.</p> <p>New tariff methodologies recently have been implemented, and the first tariff decisions have been made for a number of smaller DH systems. This led to tariff increases, which improved the financial viability of DH utilities, taking an important step toward cost-reflective heat energy tariffs. The key test will be the ability of the state-owned HEP DH (accounting for 6 of the 10 largest DH systems and 80 percent of installed capacity) to propose and receive approval for rational heat energy tariffs. It is likely that social concerns will continue to be a factor in heat energy tariff determination, and there is a risk that such concerns may prevent the timely adaptation of cost-reflective tariffs that are fully compliant with the regulatory framework. It therefore is encouraged that strategies for targeted subsidies that benefit mainly the poorest households be considered and implemented.</p>

Table 10. Country-Specific Recommendations, continued

Country	Key Recommendations
<p>Kosovo</p>	<p>PPP in the municipal sector is allowed by law. The regulatory structure is in place, and the government officially supports it. However, the sector is sensitive due to social concerns, and there is limited municipal capacity for managing PPPs; for DH in particular, there are significant issues related to revenue collection and financial viability that should be addressed prior to private investors being brought in. If the government of Kosovo would like to test PPP in the municipal sector, and in particular in DH, it should consider identifying selected pilot projects; balancing the concerns about affordability of DH services and financial viability through structured, performance-based subsidies from local governments to DH utilities; and seeking international assistance for transaction structuring of the pilot projects.</p> <p>Currently, affordability concerns are being addressed through blanket subsidies that benefit all connected households. Strategies for targeted subsidies that benefit mainly the poorest households should be considered.</p> <p>At the end-user level, an inadequate framework for organizing multi-apartment buildings may limit energy efficiency initiatives, as no entity is responsible for common building installations. New legislation is under preparation at the time of this writing that may promote the establishment of Housing Administrations that would take over heat metering and system maintenance at the substation level. Based on metered consumption of heat, the DH company would prepare invoices (bills) for each substation, which are sent to the Housing Administration (as a result, the DH company would receive payment from the Housing Administration). Meanwhile, the Housing Administration would prepare separate invoices for consumers—individual apartment owners—based on the heated area (or according to calculations by means of heat allocators), plus typically an extra charge for the housing service. Considering the technical design of DH secondary systems in multi-apartment buildings, and the importance of safe and secure operation for reliable heat supply, the Administrator could engage a third party for operation, maintenance, and repair of the substation. The third party could be a district heating utility under a special service contract or any other specialized private company.</p>

Country	Key Recommendations
Mongolia	<p>The policy framework for PPP is in accordance with international best practice, but only one PPP project had reached financial close at the time of this writing. The lead agency role for PPP has moved several times in recent years, reducing continuity. The lead agency also has limited capacity to support the development and implementation of PPP transactions, and some ongoing transactions are implemented with limited transaction advisory. It is recommended that the government of Mongolia consider attracting financial resources and management expertise for utility services such as DH through a long-term contractual PPP. This could be promoted through establishment of a pipeline of selected PPP pilot/demonstration projects and attraction of international support for transaction structuring and implementation to increase the chance of success.</p> <p>In spite of significant fuel subsidies (domestic coal provided at production cost) and cross subsidization (between electricity and heat generation as well as between commercial and household heat customers), the end-user heat tariffs do not cover system operation and maintenance costs and are not adjusted to changes in cost basis. Therefore, the DH companies rely on subsidies from their owners, and their ability to undertake necessary system renovations and expansions is limited. The government of Mongolia should address the issue of cost recovery in the DH sector. Without a clear and trustworthy model for cost recovery and servicing of loans / payback of investments, it will be difficult to attract private investment in the DH sector unless a sovereign guarantee is provided.</p> <p>Currently, affordability concerns are addressed through blanket subsidies that benefit all connected households. Comprehensive tariff reform should be considered to ensure cost-reflective heat tariffs and targeted subsidies that benefit the poorest households.</p> <p>In the context of tariff reform, the relation between the heat consumption-based tariffs (presently applied at the substation level) and heated area-based tariffs (presently applied at the end-user level) should be analyzed, as it appears to limit the incentive for switching users to metered billing and thereby the promotion of end-user energy efficiency.</p> <p>The present tariff approval process limits the ability of the regulator (ERC) to approve tariffs that ensure that revenues of licensees are sufficient to support their financial viability. It is recommended that ERC consider engaging in a dialogue with the country's Fair Competition for Customers Agency and the Customers Rights Protection Agency on approaches to tariff adjustment that balance affordability and financial sustainability concerns.</p>

Table 10. Country-Specific Recommendations, continued

Country	Key Recommendations
<p>Serbia</p>	<p>The 2011 PPP law is in compliance with international best practice. A PPP unit has been established in the Ministry of Finance, and a practical guide and Heads of Agreement template have been published. However, there is a general lack of successfully implemented PPP projects in municipal services to date. The government of Serbia should consider: developing a pipeline of pilot/demonstration projects for PPP in municipal services (including DH); addressing the inevitable conflict between affordability concerns and financial viability upfront through structured, performance-based subsidies from local governments to DH utilities; and seeking international assistance for transaction structuring of the pilot projects.</p> <p>The independent regulator AERS will define a common methodology for tariffs, but municipalities still have to approve tariffs. Social concerns are likely to continue to be a significant determinant in municipal approval of tariffs. An independent approval procedure (for example, by the regulator) would be likely to provide a better framework for ensuring the financial viability that is necessary for development of the sector.</p> <p>The Ministry of Energy and Mining has taken over responsibility for the DH sector, and the DH sector will now be a part of the Energy Strategy. The implementation program to be prepared after the adoption of the new Energy Strategy for Serbia should explicitly consider private sector participation in the continuous modernization and extension of existing DH systems, as well as in relation to fuel switching (increasing the use of biomass, municipal waste, CHP) and end-user energy efficiency.</p>

Country	Key Recommendations
Ukraine	<p>The risk of strategic representation of projects as concessions rather than as PPPs in order to avoid the formal requirement under the PPP Law should be recognized. For smaller PPP-type concessions at the municipal level, it may be beneficial to relax upfront documentation requirements for first-of-a-kind projects or to provide central government funding for selected pilot projects to enable the development of templates.</p> <p>The PPP law could be strengthened in several areas to improve its role in regulation of PPP-type projects and to reduce ambiguity. In the context of the PPP Law, it should be considered to distinguish real PPP projects from other projects; eliminate inconsistencies between the PPP Law and other laws; improve regulation of relationships resulting from land allocation for PPP purposes; expand application of competition procedures for selection of private partners; introduce effective mechanisms and forms of state support for a PPP project; clearly define competencies of national and local authorities regarding their roles in PPPs and in the analysis of the effectiveness of a PPP arrangement; and introduce additional guarantees for a private investor.</p> <p>Renewable energy sources and CHP could provide important contributions to increased energy supply security for Ukraine. It is recommended that support be provided for development of the biomass / solid waste supply chain and market to facilitate a switch from dependence on imported gas to alternative domestic fuels. High-efficiency cogeneration should continue to be promoted in the interest of efficient use of the fuel sources. Hence, the government of Ukraine should ensure that CHP is an integral part of the renewable energy action plan.</p> <p>End-user energy efficiency can be promoted through ESCOs, but, according to the Energy Efficiency Agency of Ukraine, the current subsidy policy targets end-users and may limit the opportunities for ESCOs. It is recommended that legal and incentive barriers to the use of ESCOs in Ukraine are assessed further to enable the testing of ESCOs as a means of implementing end-user energy efficiency investments.</p>

3 | Promoting and Supporting PSP in DH: International Best Practice

3.1 Best-practice Regulatory Frameworks and Incentives to Promote PSP in DH

FRAMEWORK CONDITIONS

International experience shows that governments can facilitate private sector investment in CHP/DH by creating policies that attract private players to CHP/DH facilities:

- ▶ Tariffs should allow investors to cover full costs;
- ▶ Regulation should provide incentives for efficiency improvements;
- ▶ The regulatory process should be transparent and predictable;
- ▶ Regulators should be independent from ownership and management;
- ▶ Social protection programs should target low-income households;
- ▶ Investment decisions should consider the interests of consumers (least-cost and supply security); and
- ▶ The legislative framework and subsequent regulations have to allow for private sector participation in the sector.

Furthermore, well-designed policies can incentivize heat suppliers, network operators, and end-users to save costs and energy.

One aspect is the existence of a contractual relationship between heat suppliers and consumers that clearly defines that heat-generating enterprises are responsible for providing heat of sufficient quality and for contracting network operators (in cases where the DH sources are not part of the company or the waste heat is procured from third parties) to distribute the heat. The contract also should specify that heat suppliers have the right to disconnect customers if

they do not pay their heat bills. This, however, requires the introduction of heat consumption-based meters, which improve access to information for consumers and suppliers about heat consumption and losses. Only when they are aware of actual consumption levels rather than estimates based on norms will consumers and heat suppliers have incentives to take action to reduce their losses and costs.

TARIFF-SETTING METHODOLOGIES

Another important aspect of incentivizing efficiency is the tariff structure.

Key tariff-setting methodologies are:

1. Cost-plus, where the operator is compensated for the cost of operating the DH system with a fixed percentage of profit built in, which the operator must use to pay for upgrades.
2. Return on investment, where the operator is compensated for operating expenses, depreciation on longer-term investments, as well as a return on invested capital to be included in the base for tariff determination.
3. Tariff indexation or price cap, where prices are set to cover the costs of the preceding year multiplied by an index that reflects a change in specific conditions (such as rising fuel costs) as well as an expected annual efficiency gain.
4. Benchmarking, which allows prices to be established based on a review of a group of peer heat suppliers and thus incentivizes the more-efficient (and penalizes the less-efficient) heat suppliers in the group.

Table 11 compares the advantages and disadvantages of each tariff type.

Table 11. Comparison of Tariff-Setting Methodologies

Methodology	Pluses	Minuses	Examples of Application in DH
Cost-plus	Clear and logical calculation method; lower costs of tariff administration	Does not promote efficiency due to push-through of costs onto consumers (for example, fuel costs); asymmetry in availability of cost data to regulators	Scandinavia, Romania
Return on investment	Encourages investment and private sector involvement by guaranteeing a rate of return on investment; an energy efficiency incentive may be included explicitly (U.K. experience)	Does not have particularly strong incentives to improve efficiency or lower cost (although it could explicitly include the efficiency incentive, as with Regulatory Asset Base regulation in the United Kingdom); poses a risk for the Averch-Johnson effect (overinvestment in capital assets to increase regulatory asset base)	Estonia, Lithuania, United Kingdom
Tariff indexation / Price cap	Provides incentive for efficiency and cost savings if utility is allowed to retain energy saving; public advantage of a tariff that is more or less capped	For systems that have seen significant underinvestment, price caps may not allow enough tariff funding for modernization and unexpected equipment failures	Hungary
Benchmarking	Provides strong incentive for efficiency improvements and cost savings through market comparison; can help address asymmetry in cost data between district heating company and regulator	Requires significant data on comparable district heating systems and careful thought to adjust for differences in conditions	Used primarily in electricity markets

The countries presently rely mainly on cost-plus methods for heat tariff setting, giving the DH companies limited incentives to reduce costs and deterring investments in energy efficiency, because any potential savings would be curtailed in the following year's tariff. In parallel, the tariff structures also affect end-users' motivation to save, as consumers will be more motivated if their bills are based on their actual consumption, rather than on estimates, fixed fees, or norms of consumption.

To encourage cost efficiency and energy efficiency, regulators could provide incentives for DH companies to move away from cost-plus tariffs in favor of benchmarking, return on investment, or a form of price-capping, and in parallel encourage a move from norm-based tariffs toward consumption-based tariffs at the household level.

POLICIES USED TO PROMOTE DH/CHP

DH systems and CHP often require higher upfront investments than conventional alternatives. This can deter operators from investing in DH and CHP, even though operating costs may be lower and socioeconomic benefits (for example, when internalizing externalities such as greenhouse-gas emissions) may be significant. In such situations, several policy measures may be used to help trigger DH and CHP. The key policies used internationally to promote DH and CHP are:

1. **Feed-in tariffs**, which provide direct operational support for CHP and renewable energy generation. A feed-in tariff usually takes the form of a bonus added to the market electricity price paid to generation plant operators for each kilowatt hour (kWh) of electricity supplied to the public network, but it also can be fixed

Table 12. Overview of Support Mechanisms for DH/CHP

Support Mechanism	Policy Goal	Success Factors	Examples of Application
Feed-in tariffs	Provide greater certainty for investors in CHP and incentivize organizations to operate efficient CHP plants	The level and duration of the feed-in tariff should allow a sufficient return to attract investments	Czech Republic, Denmark, Germany, Hungary, Netherlands, Portugal, Spain
Capacity grants	Address the issue that DH and CHP often require higher upfront investments than conventional alternatives	Should target developers that lack financing Requires careful analysis of the market Level should be reviewed on a regular basis to reflect changes in technologies and market conditions	Belgium, Italy, Netherlands, Spain
Fiscal support	Provide greater certainty for investors in DH/CHP and incentivize organizations to invest in efficient DH/CHP	Allow CHP/DH developers accelerated depreciation on investments and/or exemption from fuel taxes without inducing too-high administrative burdens	Belgium, Italy, Germany, Netherlands, Sweden, United Kingdom
Utility supply obligations	Make CHP plants competitive in the electricity market and guarantee a market for CHP electricity. Create a demand for CHP electricity through a purchase obligation on electricity suppliers	Obligation share should be high enough to create scarcity and sustain demand but also reflect a realistic potential for developing CHP. Can be supported by a ceiling (buy-out price) and a floor (guaranteed minimum price)	Most EU countries (for renewable energy); Belgium, Poland (for CHP)
Heat planning/zoning	Establish efficient low-emission energy systems in urban areas, including DH infrastructure	Requires knowledge of heat demands and available sources as well as coordination at the municipal level among policymakers, energy suppliers, and customers to establish clear goals	Denmark, Germany, Sweden
Interconnection and grid access measures	Streamline interconnection procedures, enable grid access for CHP (through net metering, priority dispatch, and licensing exemption to improve commercial conditions), and ensure fair treatment of CHP	Close monitoring of all stakeholders by regulators; development of standards that address all elements of the interconnection process	Most EU countries, United States

independently of the electricity price, and it may be combined with an obligation on the network operator to buy CHP or renewable energy-based electricity.

2. **Capacity grants**, or upfront one-off subsidies provided to facilitate installation of CHP/DH systems when upfront costs present a barrier to investment.
3. **Fiscal support or incentives**, for example in the form

of tax relief that allows accelerated depreciation of CHP/DH investments for tax purposes or that provides exemption from fuel or carbon taxes.

4. **Utility supply obligations**, which use the trading of certificates to guarantee a market for CHP electricity by placing an obligation on electricity suppliers to source a certain percentage of their electricity from CHP.

5. **Heat planning or “zoning,”** coordinated municipal processes to establish efficient, low-emission energy systems in urban areas, including DH infrastructure and generation based on CHP and renewable energy sources.
6. **Interconnection and grid access,** comprehensive policies to streamline interconnection procedures, enabling grid access for CHP and incentives for network operators to ensure fair treatment of CHP.

Table 12 provides an overview of the policy goals, success factors, and examples of countries where these support mechanisms are applied.

3.2 Best-practice Business and Financing Models to Support PSP in DH

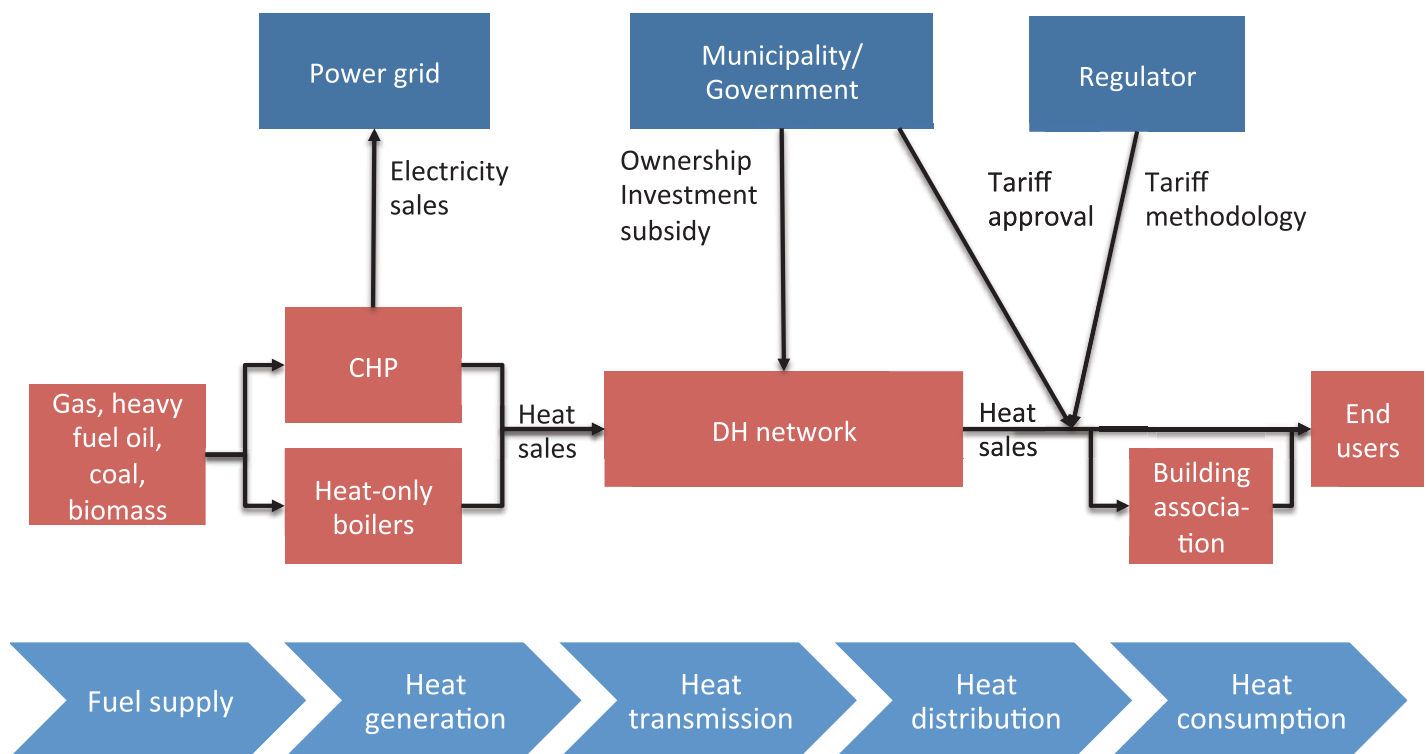
3.2.1 TRADITIONAL PUBLIC PROVISION OF DH VS. PPP

Traditional public provision of DH is when the service is provided by a government or municipal department or by a public authority or a publicly owned company.

Figure 15 provides an illustration of the DH value chain, from fuel supply, heat generation, and transmission, to the distribution of the heat to end-users.

Under the traditional model, the government (national or municipal) owns the CHP plant or conventional (heat-only)

Figure 15. Traditional Public Provision of DH



boiler used for generation and also owns the DH network, regulates the sector, provides investment support, and determines tariffs.

The traditional model has, in most economies in transition, been characterized by challenges related to inadequate maintenance, insufficient funds for infrastructure development, poor planning and project selection, as well as inefficient or ineffective delivery. These challenges are a key reason for considering alternative delivery models involving the private sector through public-private partnership (PPP) or private sector participation (PSP).

A PPP is a long-term contractual agreement on private provision of services that traditionally have been provided by the public sector. As discussed in this chapter, it includes a continuum of models that reflect the increasing transfer of risk and responsibility from the public sector to private operators. A key premise is, however, that the political responsibility for the provision remains with the public authorities. PSP in DH is used to describe situations when the provision of DH services involves a PPP.

PSP may contribute to solving the challenges of the traditional model by providing long-term investment perspective, enabling access to additional sources of funding, and providing private sector experience, innovation, and incentives.

The involvement of the private sector through a PPP may create value for the public authority that holds political responsibility for the provision. This value is created through output-based contracting (compared to input-based contracts when procuring deliverables under the traditional model), optimized risk allocation (which transfers project risks to the party most able to manage them), optimization over the project lifecycle (through the integration of responsibility for design, construction, and operation), improved incentives for quality service provision supported by performance-based payments (depending on quality of service delivered), as well as access to additional financing sources.

PPPs are a variety of models that reflect the increasing transfer of responsibility for service provision, ranging from

management contracts and lease contracts to concessions and private provision (privatization of existing assets and Build-Own-Operate for new assets), as well as models designed to address specific challenges in the DH supply chain, such as heat entrepreneurship (mobilizing the biomass supply chain) and ESCOs (addressing investment barriers at the end-user level).

The key business models for private sector participation in DH used internationally and described in further detail below are:

- ▶ **Management agreements**, where a company takes on the responsibility for managing the DH system and conducting sales, as well as minor upgrades.
- ▶ **Leasing**, where a private party (lessee) takes on the operation, management, and implementation of facility upgrades under a contract with the public party (lessor).
- ▶ **Concession agreements**, where the concessionaire takes on the responsibility for investment in system upgrades under a long-term concession agreement.
- ▶ **Privatization**, where a private investor brings financing for DH and seeks recovery through heat sales, with the government providing framework conditions through tariff regulation, energy planning, standards, and norms.
- ▶ **Heat entrepreneurship**, a model developed in Finland since the early 1990s that facilitates the development of biomass-based heat generation and distribution through a partnership-based approach involving the wood fuel supply chain.
- ▶ **Energy service companies (ESCOs)**, which address investment barriers at the end-user level through provision of energy services to final energy users, including the supply and installation of energy-efficient equipment and/or the refurbishment of buildings; they can arrange financing for the operation, with their remuneration being tied directly to the energy savings achieved.

Table 13 illustrates key differences in the allocation of risk and responsibility of these models.

The sections below discuss the international best-practice business models introduced above.

Table 13. PSP Models

	Operation and Management	Payment for Services	Investment	Ownership
Management agreements	Private	Public	Public	Public
Leasing	Private	Private	Public	Public
Concession agreements	Private	Private	Private	Public
Privatization	Private	Private	Private	Private
Heat entrepreneurship	Private	Public/Private	Public/Private	Public/Private
ESCOs	Private	Private	Private	Public/Private

Note: Public may be by local or national government



3.2.2 MANAGEMENT AGREEMENT

A management agreement involves the outsourcing of public service management, while the ownership and investment decisions are retained in the public sector.

Management agreements generally are short term (two to five years) and usually do not involve any transfer of employees to the operator.

The private operator is usually paid a fixed fee to cover its staff and expenses, as well as a performance-based fee linked to the quality of the service provision, with liquidated damages for failure to achieve performance parameters.

The operator under a management agreement is required to collect bills on behalf of the utility and may accept some

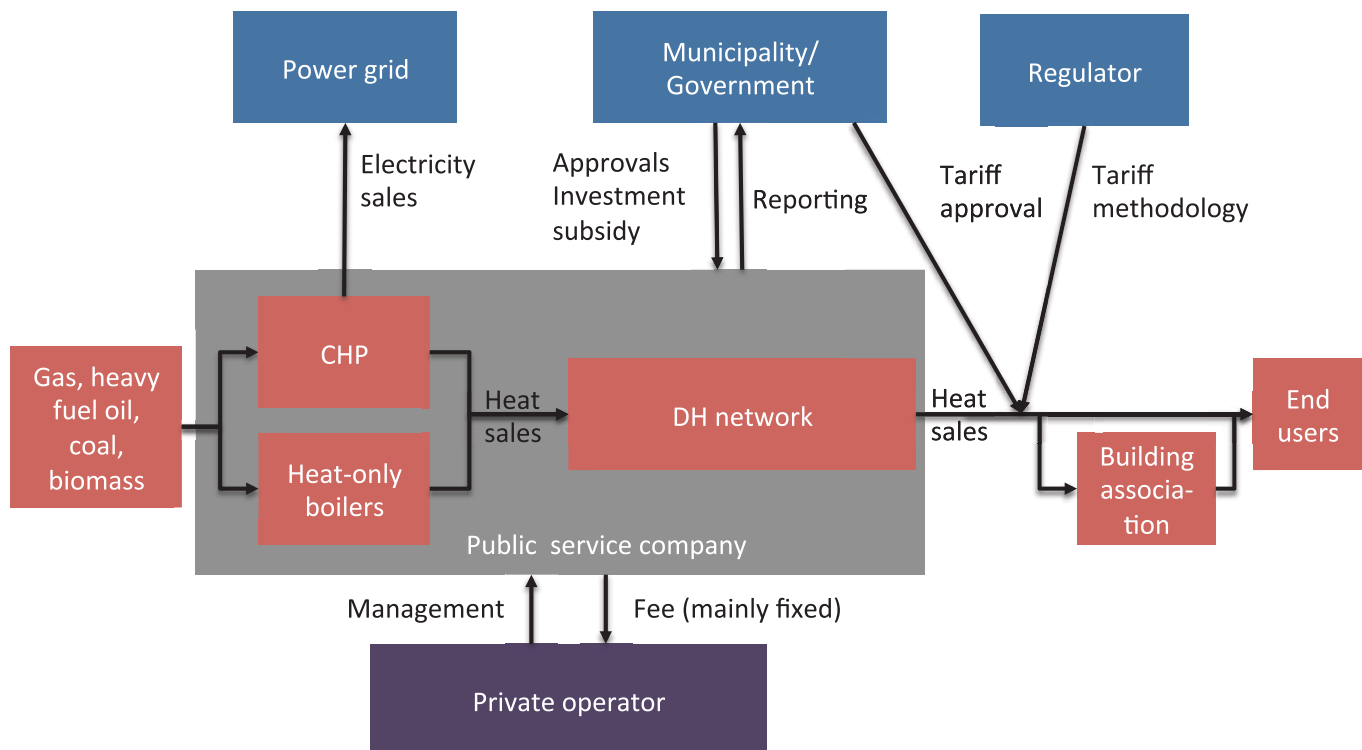
collection risk in terms of performance standards, but it is unlikely to collect bills on its own behalf.

Management agreements may include obligations on the private operator to operate and maintain the assets, and they may include the cost of routine replacement of small, low-value components of equipment.

The benefits that can be realized from a management agreement compared to the traditional model include addressing issues of poor management in an existing public company and enabling a separation of the operation and regulation of district heating.

However, it should be noted that management agreements have only limited potential for improvements in efficiency

Figure 16. Management Agreement Model for Provision of DH



Box 1. Management Agreement for the Kolpino CHP Plant in St. Petersburg, Russia

Management agreements cover a range of different models, from operation and maintenance (O&M) support services where the private partner provides local support to the client's staff as well as performance monitoring of the plant; to O&M management where the private partner takes responsibility for the operations management (including key managers) but the power plant owner provides the staff of the plant; to full-scope O&M where the private partner takes full responsibility for the operation and maintenance of the client's power plant, including the planning of operation, performing daily operations, plant maintenance, material and resource management, and continual improvement.

The management agreement entered by Fortum for the Kolpino CHP Plant in St. Petersburg, Russia, is an example of O&M support services where the private partner participated in the client's energy upgrade and efficiency project. The management agreement is entered with GSR Energy, a major supplier of heat energy to residents in the Kolpino district of St. Petersburg that is partly funded by Macquarie Russia and CIS Infrastructure Fund (in which IFC is one of the investors).

The Kolpino Combined-Cycle Gas Turbine power plant is situated in St. Petersburg's rapidly growing northwest industrial district. The plant had previously selected GE's advanced gas turbine technology and Siemens' steam turbines as the basis for its power plant upgrade.

In 2011, the private partner Fortum signed a long-term service agreement with GSR that included optimization of the service and spare parts strategy, streamlining of the O&M organization, and the provision of IT systems, including an Integrated Management System and a Customer Management System.

The realized benefits for the client included access to the private partner's long-term international experience in operating and maintaining gas turbine-operated power plants; restructuring of the O&M organization with clearer responsibilities, higher efficiency, and significant head-count reduction; the introduction of Western European O&M business processes integrated with organizational and Power IT systems; the transfer of know-how and training, and access to the private partner's expert service network and remote support.

The original agreement covered 2011–2014, and the partners met in April 2015 to discuss future cooperation based on the successfully achieved results.

and performance, and they typically do not bring in large-scale financing.

Figure 16 provides an illustration of a management agreement for provision of DH. In the example shown, the management agreement covers both generation as well as transmission and distribution, which is assumed to be combined in one public service company; however, the management agreement could equally well be for a more limited part of the value chain if generation and transmission/distribution are separated in several public entities.

Management agreements in DH are, for example, used in the Czech Republic, Russia, and Sweden. Box 1 provides a case example of a management agreement.

3.2.3 LEASE AGREEMENT

A lease agreement involves a private party (lessee) taking on the operation and management, as well as the implementation of facility upgrades, under a contract with the public party (lessor). The lessor receives rent payments from the lessee that are reinvested into facility upgrades, which the lessee is contracted to implement.

Lease agreements generally are medium-length (8 to 15 years) and involve employees being seconded or transferred to the operator.

The lease fee is either fixed or, in case of an “affermage”¹, the employer receives net receipts from customers less an

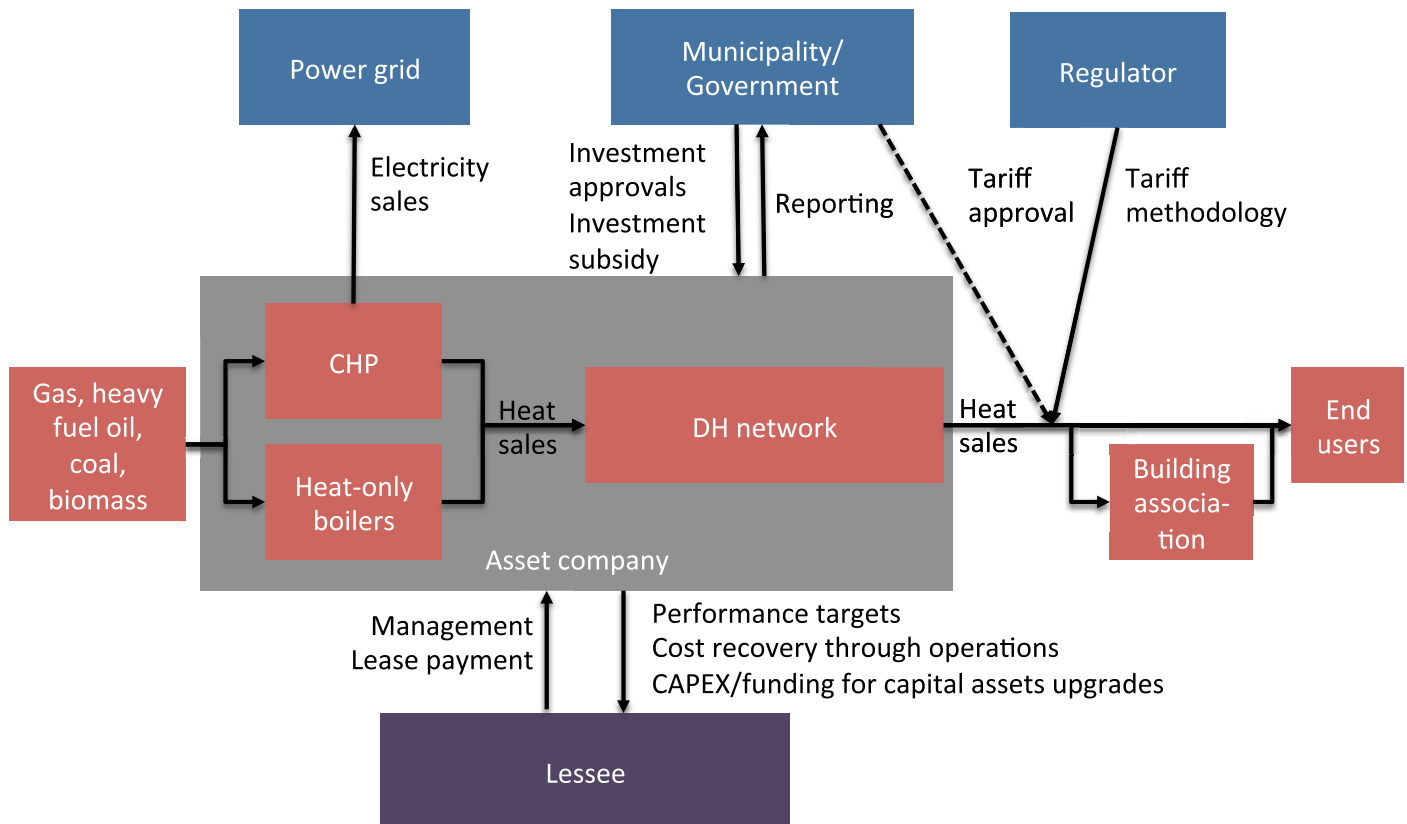
¹ In the case of an affermage, the operator retains the operator fee out of the tariff receipts and pays an additional surcharge (charged to customers) to the awarding authority to go toward investments that the awarding authority makes or has made in the infrastructure.

affermage fee. The lessee recovers the lease costs via the operation, and the revenue collection risk is passed to the lessee. Therefore, the lessee requires assurances as to the tariff levels and increases over the term of the lease, as well as a compensation/review mechanism if tariff levels do not meet projections.

The cost of maintenance and some replacement is passed to the lessee, and the lessee assumes some degree of asset risk in terms of the performance of the assets. Furthermore, the lessee may be put in charge of overseeing the capital investment program/ specific capital works.

The lessee will maintain an asset register and operation and maintenance manuals/records, etc., and the contract typically will include minimum maintenance or replacement

Figure 17. Lease Agreement Model for Provision of DH



Box 2. Lease Agreement for the Vilnius DH System in Lithuania

In Lithuania, around one-fifth of the municipalities have entrusted the management of their DH assets to private operators under long-term lease agreements, where operation and management, revenue collection and investment are privately managed but ownership remains public. The employees are transferred to the lease company, and, after contract expiration, they are transferred back to the municipal DH company.

In Vilnius, the lessee is JSC Vilniausenergija (a subsidiary of Veolia) under a 15-year lease contract. The level of investments and its schedule is defined in the lease contract and includes reconstruction of the heat network, elimination of group heat substations, reconstruction of boiler houses, and innovative solutions with regard to a remote data collection and monitoring system. Furthermore, the DH company has established a €5.8 million Energy Efficiency Fund, which financed 75 percent of the individual heat metering costs of more than 10,000 households in Vilnius.

The benefits for the city have included activation of the DH market, increased operational efficiency, access to financial resources, accelerated investments in system renovation, and improved asset management. Furthermore, the private sector helps the city to achieve other goals such as pollution reduction and fuel switching.

The State Commission for Energy Control and Prices defines the methodology for price calculation, including an acceptable level of cost recovery with a regulated profit that provides incentives to invest in DH system renovation, as a return on investment can be recovered by private and municipal-owned DH enterprises. The DH company calculates the price according to Commission methodology and presents it for approval by the municipality board, but the Commission has a right to approve the price unilaterally if justified prices are not approved by the municipal board. The state government applies a reduced VAT (9 percent instead of 21 percent) for heat prices for all residential consumers, and low-income consumers are protected through a national compensation mechanism.

provisions toward the end of contract to ensure that the facilities are handed back to the lessor in an operational state.

In addition to the benefits realized under a management agreement, a lease agreement provides stronger incentives for operational efficiency and improved asset management.

But a lease agreement also limits the authority's right to intervene and involves a risk of degraded asset quality at hand-back if not adequately regulated in the lease agreement. Furthermore, lease agreements typically do not mobilize additional capital.

Figure 17 provides an illustration of a lease agreement for provision of DH. Again, the example shown covers both generation as well as transmission and distribution, but the lease agreement could equally well be for a more limited part of the value chain.

Lease agreements in DH are, for example, used in Estonia and Lithuania. Box 2 provides a case example of a lease agreement in Lithuania.

3.2.4 CONCESSION AGREEMENT

Under a concession agreement, the public authority grants a private party (concessionaire) the right to renovate, finance, and operate an existing infrastructure asset, or (in the case of a Build-Own-Operate-Transfer) to design, build, finance, and operate a new infrastructure asset. The assets are owned by the public sector, but concession agreements usually are long-term in nature (typically 25–30 years) to enable the concessionaire to recover investments, after which responsibility for the operation reverts to the public authority.

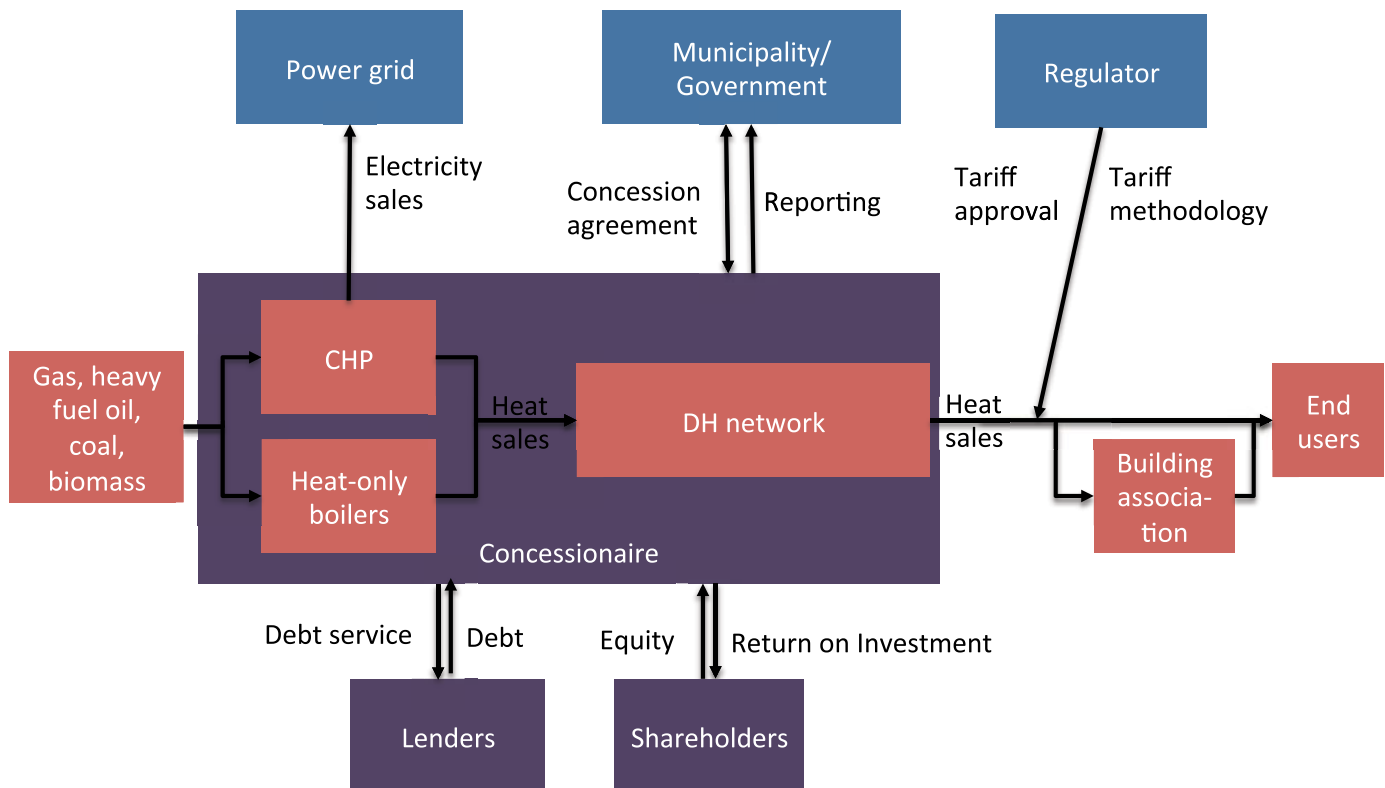
The concessionaire recoups its investment, operating, financing costs, and profit by selling its services directly to the end-user of the services. The concessionaire usually pays a concession fee to the awarding authority.

The concessionaire usually assumes risk of demand for use of the asset, as well as risks of design, finance, construction, and operation. The public authority, however, may share the demand risk by agreeing to a minimum level of usage.

User charges may either be prescribed in the contract or set by the concessionaire under supervision of a sector regulator.

The benefits of concession agreements include the benefits of management agreements and lease agreements; in addition to this, a concession agreement provides stronger incentives for operational efficiency and for optimizing lifecycle costs—and, importantly, well-structured concession agreements may mobilize additional financial resources.

Figure 18. Concession Agreement Model for Provision of DH



Box 3. Concession Agreement for DH in Paris, France

The Paris DH system is operated by the Paris Urban Heating Company (CPCU) under a concession, originally obtained in 1927. The system has 4,000 MW_{th} of heat generation capacity, a 450-kilometer network, and 460,000 customers (one-third of Paris), and it is more than 50 percent based on renewable energy sources (primarily geothermal and biomass resources). CPCU is owned two-thirds by GDF Suez and one-third by the city of Paris. As remuneration for the concession, CPCU pays 1.85 percent of the annual turnover to the city of Paris.

The government of France recently provided a €26 million direct grant to CPCU for the construction of a district heating transmission pipeline and related local district heating networks in the northeast of Paris. The French authorities also extended the district heating concession by seven years, to 2024, to allow the concessionaire to recoup the €170 million network investment costs without undermining the commercial operation of the concession contract.

This district heating project will allow new customers to switch to a more environmentally friendly heating source and will facilitate the future development of renewable heating boilers by CPCU. The network is to be built along the T3 tramway line under construction in Paris. District heating was not available previously in this area (customers were using other forms of heating such as individual electric heating) and will result in a significant reduction of carbon dioxide emissions compared to heating from conventional sources. More generally, it will encourage future investments in renewable heating boilers to be connected to this network and will lead to the closing of a conventional boiler using fossil fuel in this area. Thanks to this and other projects under way, by 2020 nearly 20 percent of the energy used in the heating of Paris would come from renewable sources (biomass, biogas, geothermal), as opposed to none at the moment.

The project will increase the beneficiary's sales by less than 5 percent and introduce a new competitor among the providers of heating in the northeast of Paris. The French authorities have committed either to putting out the concession for tender in 2024 or to operating it in their own account as of 2024.

However, concession agreements also require relatively advanced framework conditions: the responsible authority has to be willing to delegate operation and maintenance, design, and investment decisions; the tariff determination has to be independent or backed by a compensation mechanism for inadequate adjustments; the output-based requirements and allocation of project risks have to be defined prior to contracting; and obligations related to present workers and non-commercial service have to be addressed upfront.

Figure 18 provides an illustration of a concession agreement for provision of DH. Again, the example shown covers both generation as well as transmission and distribution, but the concession agreement could equally be for a more limited part of the value chain.

Concession agreements in DH are, for example, used in France and Romania (Ploiesti). Box 3 provides a case example of a concession agreement.

3.2.5 PRIVATIZATION

Privatization may involve full divestiture of an existing utility or private provision of new assets through Build-Operate-Transfer.

Full divestiture of an existing utility usually will be accompanied by limitations on the private operator, which will be required to hold a license to provide the service, and such license is subject to termination. Hence, although full privatization is often considered to be a more final form of private sector involvement in a utility than a concession, similarities often exist.

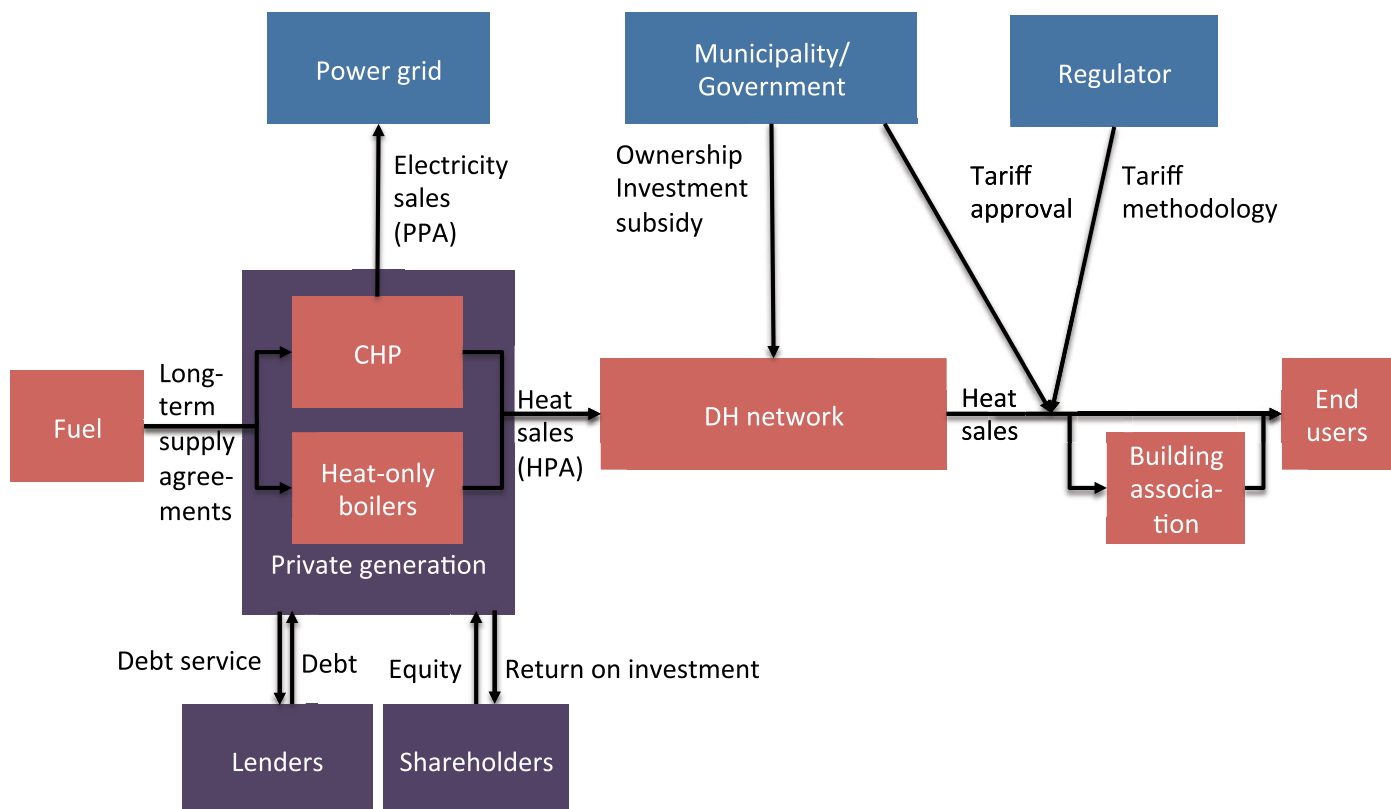
Another form of privatization is private provision of a new asset through a Build-Operate-Transfer contract. This

typically is used to develop a discrete asset rather than a whole network and is generally entirely new or greenfield in nature. For Build-Operate-Transfer projects, the operator generally obtains its revenues through a performance-based availability payment charged to the utility/government rather than through tariffs charged to consumers.

Figure 19 provides an illustration of privatization or private provision of heat generation assets. The revenue basis is a combination of electricity sales to the power grid (under a power purchase agreement) and heat sales to the public DH transmission company (under a heat purchase agreement).

Privatization in DH has, for example, been used in the Czech Republic, Poland, and Romania. Box 4 provides a case example of privatization in Poland.

Figure 19. Privatization Model for Existing or New Heat Generation Assets



Box 4. Privatization of a Cogeneration Plant and DH Network in Poznań, Poland

The Poznań DH system supplies heat to more than 60 percent of the inhabitants of the regional capital Wielkopolska and up to a dozen other towns in the region through a 470-kilometer DH network. The generation capacity of 1,090 MW_{th} is mainly cogeneration and is based on 87 percent coal and 13 percent biomass.

Under the Polish privatization process in the early 1990s, the existing municipal DH assets were corporatized and restructured and subsequently sold to Dalkia in 2002. (In connection with the sale of Veolia's majority ownership in Dalkia to Électricité de France in July 2014, the activities in Poznań continued as Veolia Energy Poznań.)

Upon privatization, the new owners upgraded and expanded the DH system, invested over €20 million, and improved the financial viability of the system. The network was expanded to serve some 10,000 additional households, representing close to 100 MW_{th} in new connections. This resulted in a 12 percent reduction of network breakdowns between 2002 and 2003, as well as in improved energy efficiency.

The network extension also resulted in elimination of the city's small coal-fired facilities, which had caused considerable pollution.

The contractual framework for the sale of the DH assets required the operator to invest in sources of heat production for the district network. This could have been done either by building a new power plant or by acquiring shares in the state-owned company supplying the network, which was slated for privatization. The operator chose the second option, and, in March 2004, the Polish treasury department awarded the contract privatizing the Poznań electricity and heat generating plant to the operator.

Entry to an international group has enabled the DH company to improve operational efficiency, carry out investments, and develop new services. Today, the Poznań DH company offers energy services for buildings through which it designs, builds, and operates installations (boiler rooms, networks, central heating, and hot and cold water supply systems) on behalf of the building owners. It also offers energy services for businesses, including management of technical installations, advice on energy efficiency, and implementation of investments related to cogeneration, biomass, and heat pumps.

3.2.6 HEAT ENTREPRENEURSHIP

The heat entrepreneurship model has been developed in Finland since the early 1990s to facilitate the development of biomass-based heating plants and DH networks through a partnership approach. A key feature is the involvement of the biomass/wood fuel supply chain (for example, through equity participation in the generation capacity) to reduce supply chain risks, as well as a carefully crafted balance of ownership and responsibilities among stakeholders. Apart from this involvement of the biomass/wood fuel supply chain, the heat entrepreneurship model may otherwise be structured much like the earlier-discussed PSP models.

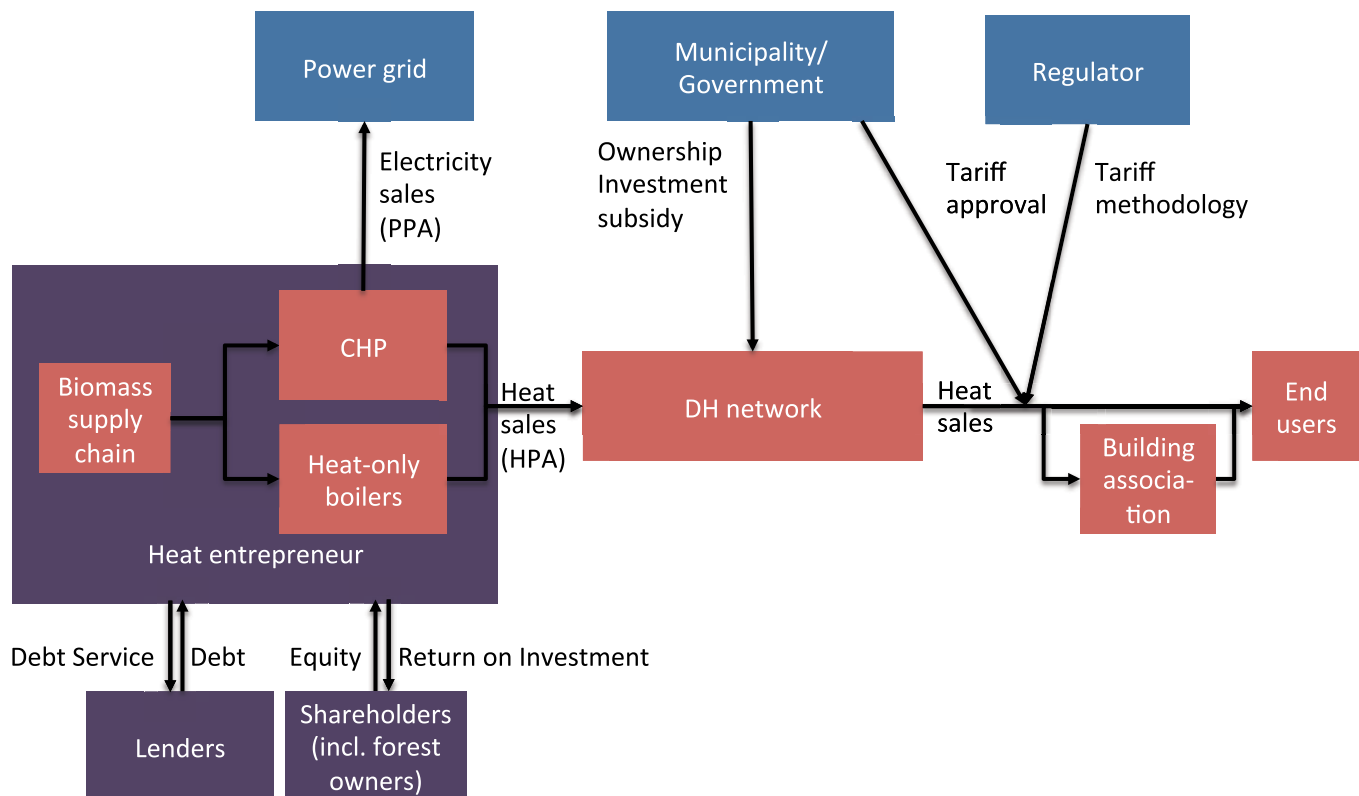
Heat entrepreneurship may be “investment by customer,” where the entrepreneur oversees the practical operation and maintenance, while the municipality bears the investment

risk; here, the involvement of the heat entrepreneur has parallels to a management contract. Alternatively, heat entrepreneurship may be “investment by entrepreneur,” where the entrepreneur (or a third-party investor) bears the investment risk, and the involvement of the entrepreneur resembles a concession agreement.

Figure 20 provides an illustration of heat entrepreneurship. In the example, the heat entrepreneurship does not encompass heat transmission and distribution, but that could equally have been the case. However, the model’s key difference from the other PSP models is the explicit focus on involving the biomass supply chain.

This makes the model specifically suitable for the establishment and operation of new generation capacity

Figure 20. Heat Entrepreneurship Model



Box 5. Heat Entrepreneurship in Eno, Finland

Heat entrepreneurship has been developed in Finland to establish biomass-fired heating plants and district heating networks, organize the wood fuel supply chains, and define ownership and responsibilities among all stakeholders involved (sellers/buyers of the service, subcontractors, and fuel producers).

Heat entrepreneurs operate locally at a municipal level, producing heat from local wood fuel resources. An example is the Eno Energy Cooperative in Eno (7,000 inhabitants) located in North Karelia in eastern Finland. The first heat plant was invested by the municipality, but the cooperative founded in 1999 built two more plants in 2002 and 2004 with a combined capacity of 9.5 MW.

The Eno Energy Cooperative is now the owner and operator (largely similar to a concession) of two heating centers (heating plant and distribution network) and the operator (similar to a leasing agreement) of five heating centers. Heat from all three plants is sold on a 15-year agreement to the municipality and in parallel to private customers. Fuel wood is mainly (70 percent) supplied by the more

than 50 cooperative members (mostly forest owners who carry out the harvesting themselves) and is partly sourced on the open markets.

The benefits in Eno include heat being cheaper for consumers compared to light fuel oil (about half price). For forest owners, local farmers, and contractors, heat entrepreneurship provides extra income, benefits of improved forest management, use of under-utilized harvesting equipment, and increased employment. For the municipality, heat entrepreneurship provides increased security of heat supply, savings in operational and investment costs of energy production (when fuel oil is replaced with cheaper wood fuels), increased use of local labor, and creation of new business opportunities, as well as environmental benefits.

A one-hectare forest yields 250 m³ of roundwood (for the local sawmill/pulp mill) and 160 m³ of forest residues and stumps (of which one-third will be left in the forest as fertilizer). This in turn yields 40 m³ of bark, sawdust, and other wood residues (from the sawmill/pulp mill) and 110 m³ of forest chips (from forest residues and stumps). This results in 150 m³ total of wood fuels, which can generate 170 MWh of heat and 85 MWh of electricity.

based on biomass and for the management of the related supply chain, and the solution may be implemented independently of the ownership and management model selected for the rest of the heating system.

Heat entrepreneurship, originally developed in Finland and subsequently tested in Canada and Russia, may be an interesting inspiration for mobilization of the biomass supply chain. Box 5 provides a case example of heat entrepreneurship.

3.2.7 ESCO

An energy services company (ESCO) provides energy services to final energy users (such as households), including the supply and installation of energy-efficient equipment and/or building refurbishment.

In a “shared savings” model, the ESCO makes investments, whereas in a “performance guarantee” model, the ESCO provides a savings guarantee and the host company or housing association makes investments.

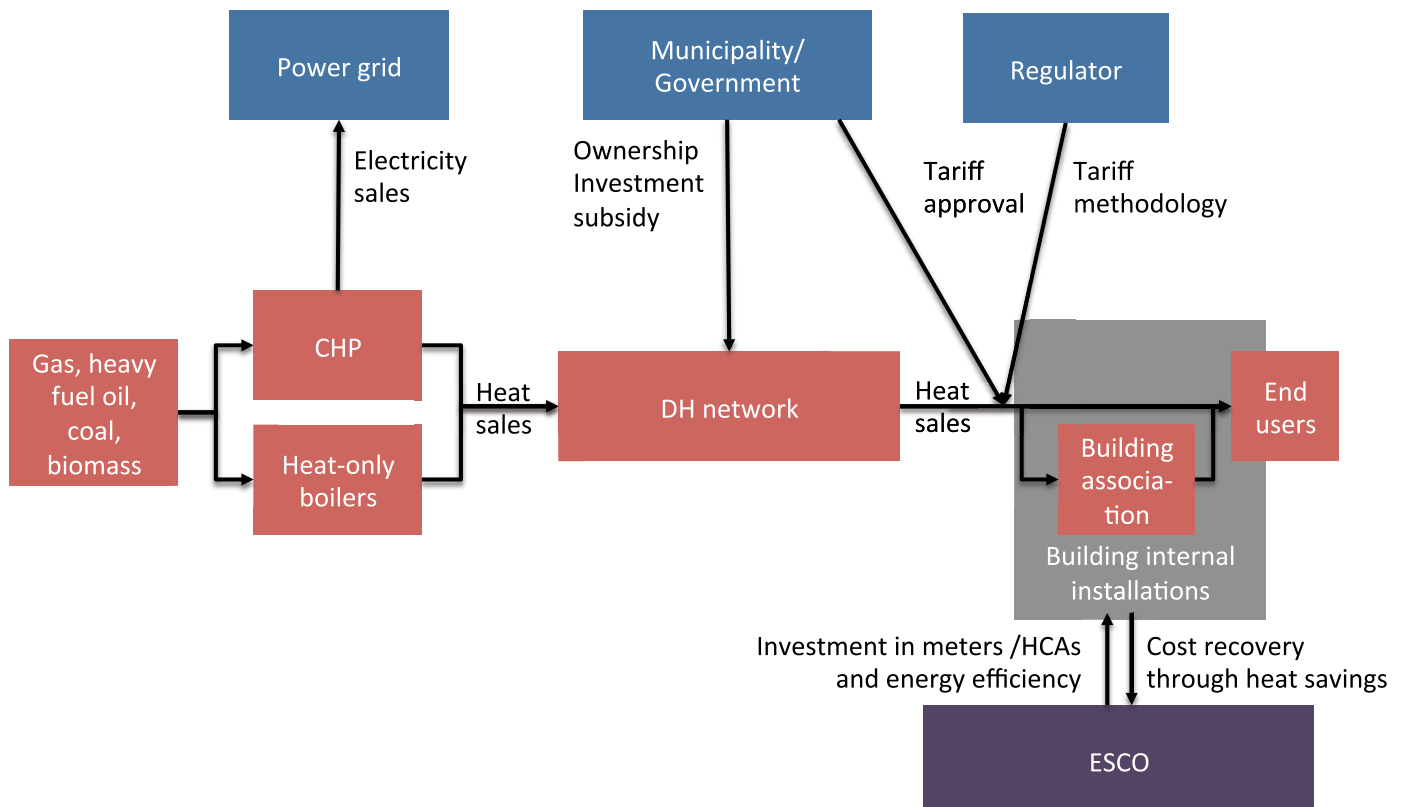
The ESCO guarantees energy savings and/or provision of the same level of energy service at lower cost, and the remuneration of the ESCO is tied directly to the energy savings achieved. Therefore, the ESCO accepts some degree of risk for the achievement of improved energy efficiency.

In some countries, the ESCO market has been facilitated by third-party insurance of the energy savings, with such risk mitigation instruments typically being supported by development banks.

Figure 21 provides an illustration of an ESCO for end-user energy efficiency in DH.

ESCOs in DH have been used in a number of countries, including the United States and Greece, from which the case example in Box 6 comes.

Figure 21. ESCO Model for End-user Energy Efficiency in DH



Box 6. ESCO¹ Agreement for Serres DH in Greece

The Thermie Serres CHP plant started operation in 2007 as the first CHP in Greece. Electricity from the cogeneration is delivered directly to the national transmission grid, while the heat covers the needs for heating and sanitary hot water for buildings in the city of Serres, in northern Greece. The gas-fired CHP is backed up by gas-fired conventional (heat-only) boilers covering peak district heating demand. State support to enhance the CHP project's viability was essential for project implementation and was provided through an investment subsidy (under Greek Investment Law 3299/2004) and the state feed-in tariff regime.

The heat and electricity producer, Thermie Serres SA, established a subsidiary, WARM Serres SA, that distributes the heat to consumers in Serres. About 800 buildings with more than 10,500 apartments have been provided with supply and installation of consumer substations, free of charge for the consumers to ensure a high connection rate. The result is a highly efficient district heating system with high production efficiency and high heat density along pipelines.

¹ An energy service company (ESCO) provides energy services to final energy users (for example, households), including the supply and installation of energy-efficient equipment and/or building refurbishment.

A separate private company, Techem Energy Contracting Hellas EPE, acts as an ESCO that provides substations, meter reading, and billing services and engages in the collection of payments and invoices. The consumer signs a common contract with both WARM Serres SA and Techem Energy Contracting Hellas EPE for heat supply and for the supply and installation of a substation.

Ownership and maintenance of the substation remains with WARM Serres SA, but Techem Energy Contracting Hellas EPE provides meter reading, billing, and collection. Consumers are not obliged to use district heating, but they are charged an annual fixed fee for maintenance and equipment costs, thereby providing an incentive to use district heating. The main benefits of this setup are a high connection rate (ensuring, fast penetration of district heating in Serres), high network efficiency, high production efficiency, and a high collection rate due to reliable heat services and affordable prices.

Techem furthermore provides energy services to its residential and commercial customers and offers to assume the full risk of energy renovations on behalf of customers, including undertaking all works, ensuring increased efficiency, guaranteeing financial soundness and long-term stability, and ensuring agreed reductions in carbon dioxide emissions.

Table 14. Assessed Readiness for PSP in DH

Readiness for Best-practice Business Models for PSP in DH	Bosnia and Herzegovina	Croatia	Kosovo	Mongolia	Serbia	Ukraine
Management agreements	I	I	I	I	I	I
Leasing	I	I	I	L	I	I
Concession agreements	L	I	I	L	I	I
Privatization	L	I	L	L	L	L
Heat entrepreneurship	I	I	I	L	I	I
ESCOs	I	I	L	L	I	I

I: Immediate options (requiring no or minor changes in existing framework conditions)

L: Longer-term options (requiring comprehensive implementation of the country-specific detailed recommendations on the improvements to primary and secondary legislation, institutional set-up, etc.)

3.3 Applicability of Business Models in Case Countries

Based on the best-practice business models described in Section 3.2 and on the identified barriers and regulatory/institutional bottlenecks for the individual countries described in Sections 2.3 and 2.4, Table 14 provides an assessment of the immediate options (requiring no or minor changes in existing framework conditions) and longer-term options (requiring comprehensive implementation of the country-specific detailed recommendations) for private sector participation in district heating in the six countries.

As noted in the table, all six countries are ripe for management agreements in DH, and all but Mongolia (due to legal limitations) are ready for leasing agreements in DH. With respect to concession agreements, the lack of a clear strategy and sector legislation in Bosnia and Herzegovina and the need for comprehensive subsidy reform in Mongolia makes it a longer-term option, whereas the four other countries are ready for concession agreements in DH. Among the six countries, only Croatia has the necessary legislation in place to enable privatization.

The experience with heat entrepreneurship may inspire both the Western Balkan countries and Ukraine to consider approaches that utilize the vast biomass potential in the region. ESCOs are a relevant option for implementation of

end-user energy efficiency measures in the Western Balkan countries and Ukraine (although Kosovo is subject to the adoption and implementation of legislative changes that are presently being planned to establish housing associations).

The countries can take various actions to attract private capital to the DH sector. Across all six countries, PPP in municipal services may be promoted by developing a pipeline of pilot projects for PPP in municipal services (including DH) and seeking international assistance for transaction structuring of the pilot projects. Similarly, all countries may improve DH sector commercial viability by separating tariff approval from ownership and addressing the conflict between affordability and financial viability through targeted, performance-based subsidies. Further to these general recommendations, the individual country recommendations presented earlier in this report will contribute to the enabling conditions for successful development of the DH sector through a partnership with the private sector.



4 | Investment Opportunities in DH

4.1 Overview of the DH Sector

The review conducted of selected DH systems in the six countries has confirmed a substantial investment need and opportunity in the sector in relation to continued network improvements to reduce heat and water losses, switch to cleaner fuels, shift to efficient CHP production, utilize waste heat, and make energy efficiency investments at the end-user level. A conservative assessment of the immediate investment needs in the DH systems reviewed is provided in the overview Table 15 and sums to \$1.5 billion.

Table 15 summarizes key aspects of the DH sector in the six countries.

Table 15. Overview of the DH Sector

Key DH Sector Aspects	Bosnia and Herzegovina	Croatia	Kosovo	Mongolia	Serbia	Ukraine
Number of DH companies	22	20	3	7	58	21 (largest systems)
Installed capacity	1,000 MW _{th}	2,000 MW _{th}	200 MW _{th}	2,000 MW _{th}	6,000 MW _{th}	21,451 MW _{th} (heat-only boilers)
Main fuel use	Natural gas, mazut (heavy fuel oil), coal, and biomass	Natural gas	Mazut	Coal	Mazut, natural gas, coal	Natural gas
Ownership of DH companies	Municipalities/cantons	State, municipalities, and partly private	Municipalities	State	Municipalities	Municipalities
Tariff methodology established by	Municipalities/cantons	Energy Regulatory Agency	Energy Regulatory Office	Energy Regulatory Commission	Municipalities (but new energy law will include common methodology)	National Energy and Communal Services Regulatory Commission and local self-governments
Tariffs approved by	Municipalities/cantons	Energy Regulatory Agency	Energy Regulatory Office	Energy Regulatory Commission	Municipalities	National Energy and Communal Services Regulatory Commission
Heat tariff level (metered households in capital)	\$0.047/kWh + \$0.32/m ² /month	\$0.028/kWh (consumption) + \$11.2 /kW/year (capacity) + \$13.7/year + \$0.98/m ² /year (fixed element)	\$0.057/kWh + \$0.83/kW per month	\$0.0061/kWh	\$0.07/kWh + \$0.42/m ² /mth	\$0.021/kWh (April 1, 2015)
CHP electricity feed-in tariff (biomass- / gas-fired CHP)	8.6 / 8.6 U.S. cents/kWh	14.5 / 9.8 U.S. cents/kWh	8.88 / [N/A] U.S. cents/kWh	Negotiated individually	16.25 / 11.1 U.S. cents/kWh	11.6 / [N/A] U.S. cents/kWh (January 1, 2015)
Assessed investment need (\$ millions)	100+	40	230	270	220	600+

BOSNIA AND HERZEGOVINA

Centralized district heating services in Bosnia and Herzegovina exist in 22 cities and towns, with a combined capacity around 1,000 MW_{th}. Sarajevo and Banja Luka account for 75 percent of total installed capacity:

- ▶ Sarajevo (Federation of Bosnia and Herzegovina), 51,800 connections, annual sales of \$31.7 million
- ▶ Banja Luka (Republika Srpska), 21,800 connections, annual sales of \$16.3 million
- ▶ Zenica (Federation of Bosnia and Herzegovina), 19,800 connections, annual sales of \$10.1 million
- ▶ Tuzla (Federation of Bosnia and Herzegovina), 21,300 connections, annual sales of \$7 million
- ▶ Prijedor (Republika Srpska), 3,600 connections, annual sales of \$3.7 million
- ▶ Bosanska Gradiska (Republika Srpska), 1,950 connections, annual sales of \$1.4 million
- ▶ Pale (Republika Srpska), 725 connections, annual sales of \$0.6 million

CROATIA

The DH sector has a combined capacity of almost 2,000 MW_{th}. It is characterized by the state-owned HEP DH accounting for more than 80 percent of the total sector through its ownership of 6 of the 10 largest systems:

- ▶ Zagreb (HEP), 98,700 connections, annual sales of \$102 million
- ▶ Osijek (HEP), 11,700 connections, annual sales of \$17 million
- ▶ Rijeka, 9,900 connections, annual sales of \$7.8 million
- ▶ Karlovac, 7,700 connections, annual sales of \$7.8 million
- ▶ Velike Gorica (HEP), 5,900 connections, annual sales of \$4.9 million
- ▶ Slavonski Brod, 1,500 connections, annual sales of \$3.7 million
- ▶ Sisak (HEP), 4,100 connections, annual sales of \$3.3 million
- ▶ Vukovar, 3,700 connections, annual sales of \$2.3 million
- ▶ Zapresic (HEP), 2,400 connections, annual sales of \$1.5 million
- ▶ Samobor (HEP), 1,400 connections, annual sales of \$1.1 million

KOSOVO

The DH sector in Kosovo consists of three DH networks with a combined thermal capacity of around 200 MW_{th}:

- ▶ Pristina, 12,500 connections, annual sales of \$7.7 million (reflecting reduced fuel access in 2013, normally \$12.9 million)
- ▶ Gjakova, 1,850 connections, annual sales of \$1.2 million (reflecting reduced fuel access in 2013, normally \$2.5 million)
- ▶ Mitrovica (no longer supplies residential customers)

Furthermore, a recent study of the largest Kosovo towns without DH systems (Peja, Prizren, Gjilani, and Ferizaj) identifies several as viable for DH.

MONGOLIA

Two cities in Mongolia, with a combined capacity of 2,000 MW_{th}, have DH systems with size, income, and investment needs that could make PPP a relevant frame for system improvements and extensions:

- ▶ Ulaanbaatar, 156,000 connections, annual sales of \$29 million
- ▶ Darkhan, 20,000 connections, annual sales of \$3 million

A number of smaller cities (Erdenet, Khovd, Ulaangom, Choir, and Uliastai) also have DH; however, these systems are very small.

SERBIA

The DH sector in Serbia consists of 58 DH networks with a combined capacity of 6,000 MW_{th}. The four towns Belgrade, Novi Sad, Nis, and Kragujevac constitute 60 percent of installed capacity:

- ▶ Belgrade, 300,000 connections, annual sales of \$322 million
- ▶ Novi Sad, 85,000 connections, annual sales of \$91 million
- ▶ Nis, 28,000 connections, annual sales of \$23 million
- ▶ Kragujevac, 18,000 connections, annual sales of \$23 million

Several other DH systems have annual sales above \$5 million (Zrenjanin, Subotica, Pancevo, Bor, Krusevac, Sabac, Kraljevo, Cacak, Uzice, and Jagodina).

UKRAINE

In Ukraine, 7.5 million households (40 percent of all households) are connected to DH systems, with the 21 largest DH systems in Ukraine having a combined capacity of 26,800 MW_{th}.

- ▶ Kyiv, 686,589 connections, annual sales of \$197 million
- ▶ Kharkiv, 484,432 connections, annual sales of \$104 million
- ▶ Zaporizhzhia, 248,155 connections, annual sales of \$35.4 million
- ▶ Odesa, 225,576 connections, annual sales of \$35 million
- ▶ Lviv, 120,473 connections, annual sales of \$22.4 million
- ▶ Dnipropetrovsk, 193,564 connections, annual sales of \$19.1 million
- ▶ Poltava, 89,611 connections, annual sales of \$12.3 million
- ▶ Lutsk, 54,302 connections, annual sales of \$11.3 million
- ▶ Sumy, 61,931 connections, annual sales of \$9 million
- ▶ Ternopil, 40,184 connections, annual sales of \$9 million
- ▶ Khmelnytsky, 55,097 connections, annual sales of \$8.4 million
- ▶ Vinnytsia, 70,226 connections, annual sales of \$8.2 million
- ▶ Chernihiv, 62,319 connections, annual sales of \$8.2 million
- ▶ Rivne, 63,375 connections, annual sales of \$7.9 million
- ▶ Mykolayiv, 85,768 connections, annual sales of \$6.7 million
- ▶ Cherkassy, 40,414 connections, annual sales of \$6.6 million
- ▶ Zhitomyr, 63,273 connections, annual sales of \$6.3 million
- ▶ Chernivtsi, 39,340 connections, annual sales of \$5 million
- ▶ Ivano-Frankivsk, 30,148 connections, annual sales of \$3.7 million
- ▶ Kherson, 43,871 connections, annual sales of \$3.6 million
- ▶ Kirovohrad, 24,325 connections, annual sales of \$3.2 million



4.2 Options for Improvement of DH Systems in the Case Countries

The following general options for future development of the DH systems in the six countries have been identified.

Table 16. Identified Options for Improvement of DH Systems

Development Option	Background	Relevant in Which Countries
Network improvements to enhance system efficiency	In spite of significant investments in DH system rehabilitation over the last decade, heat and water losses remain high in most systems, making improved system efficiency a priority for most DH distribution systems over the next decade.	All
End-user energy efficiency	End-user energy efficiency could be improved by retrofitting of internal building installations.	All
Fuel switching	In the Western Balkan countries, there are significant opportunities for fuel conversion from mazut (heavy fuel oil) and coal to gas and/or biomass.	Bosnia and Herzegovina, Croatia, Kosovo, Serbia, Ukraine
CHP production	The potential for combined production of electricity and heat is not fully utilized in the four countries, due partly to unfavorable load characteristics, with heat being produced only during the daytime in winter in some systems. In contrast, CHP generally is used in Serbia and Mongolia.	Bosnia and Herzegovina, Croatia, Kosovo, Ukraine
Waste incineration	Municipal household waste is presently being landfilled, but difficulties in siting new facilities and the need to comply with EU landfill directives in the Western Balkan countries make waste incineration an increasingly attractive option.	Bosnia and Herzegovina, Croatia, Serbia, Ukraine
Geothermal energy	Some of the countries have geothermal resources within the reach of DH networks that are not being utilized.	Bosnia and Herzegovina, Croatia, Ukraine
Heat pumps	Utilization of waste heat, for example excess heat from cooling water or from industry.	Bosnia and Herzegovina, Croatia, Serbia, Ukraine
Supplying hot tap water	Some systems have no hot tap water production in the DH substations today. This is an important potential for expansion of the district heating to all-year operation and would create a better basis for future production of CHP and production based on biomass fuels and/or waste incineration.	Bosnia and Herzegovina, Croatia, Kosovo, Serbia
Transmission from planned CHP plants	CHP projects are planned mainly to replace power production capacity. Heat loads will have to be estimated carefully to avoid CHP capacity oversizing, often seen in Eastern Europe.	Kosovo, Mongolia
System expansion to replace other heat sources	Households within reach of the DH network that presently have alternative heating solutions could convert if a competitive service is provided by the DH companies and if pervasive cross-subsidies are removed.	Bosnia and Herzegovina, Serbia
Greenfield establishment of new DH systems	Some countries have existing or developing urban areas that are viable for DH but where no system has been established.	Kosovo, Mongolia
Interconnection of existing systems	Interconnection of existing smaller DH systems is an option in some cities, which may reduce staffing costs substantially and also could reduce the need for peak- and reserve load capacity.	Croatia
Conversion from open to closed systems	One system visited is still an open-type system, with hot water being drawn directly from the system, limiting the opportunities for pH control of DH water.	Mongolia



4.3 Identified Investment Opportunities

Table 17 gives an overview of identified projects at the utility level in the six countries and the assessed investment need in the sector.

Table 17. Identified Investment Opportunities in the DH Sector

Country	Assessed Investment Need (\$ millions)	Identified Projects
Bosnia and Herzegovina	220	<p>Utilization of heat from Kakanj thermal plant, construction of transmission pipeline, rehabilitation of DH network and energy efficiency of buildings (Sarajevo)</p> <p>Gas-fired CHP plant to replace heat supply from metal manufacturing plant (Zenica)</p> <p>Rehabilitation of network and substations (Zenica)</p> <p>New biomass boilers (Zenica)</p> <p>Reconstruction of DH network (Banja Luka) New biomass boilers (Banja Luka)</p> <p>Utilization of geothermal energy in DH (Banja Luka)</p> <p>Renovation and operation of DH systems (Gradiska)</p> <p>Biomass conversion of existing boiler stations (Gradiska)</p> <p>Replacement of DH network and connection of hospital (Gradiska)</p> <p>Biomass-fueled CHP (Gradiska)</p>
Croatia	230	<p>Renovation of existing DH network (Rijeka – Energo)</p> <p>Interconnection of selected separate small DH networks (Rijeka – Energo)</p> <p>Waste-to-energy CHP based on refuse-derived fuel (RDF) from Mariscina (Rijeka – Energo)</p> <p>Fuel switch to biomass-based CHP or conventional (heat-only) boiler plants (Karlovac – Gradska Toplana)</p> <p>Renovation of existing DH network (Karlovac – Gradska Toplana)</p> <p>Fuel switch to biomass-based CHP (HEP Toplinarstvo systems outside Zagreb)</p> <p>Interconnection of selected separate networks (HEP Toplinarstvo systems outside Zagreb)</p>
Kosovo	40	<p>Heat utilization from cooling water at Kosovo B power plant (Pristina)</p> <p>PPP for CHP based on lignite, biomass, and waste (Pristina)</p> <p>PPP for CHP to feed into existing DH system (Gjakova)</p> <p>Greenfield project for establishment of new DH system (Pejë)</p>
Mongolia	100+	<p>Rehabilitation of existing transmission network (Ulaanbaatar)</p> <p>System extension into uncovered peri-urban Ger areas (Ulaanbaatar)</p> <p>Upgrading of internal building installations to enable installation of thermostatic radiator valves (Ulaanbaatar)</p> <p>Conversion of the “open”-type network to a closed-type network (Darkhan)</p> <p>Replacement of aging pipe network and extension of service to new urban development areas (Darkhan)</p>
Serbia	270	<p>Fuel switch from mazut (heavy fuel oil) to biomass (Belgrade and Nis)</p> <p>Heat pumps using river water (Belgrade)</p> <p>Waste heat utilization from power plant (Belgrade)</p> <p>Independent power producer: CHP based on biomass (Nis)</p> <p>Privatization (Kragujvac, subject to prior restructuring of balance sheet)</p>
Ukraine	600+	<p>Network improvements to enhance system efficiency (all)</p> <p>Fuel switch from natural gas to renewables in CHP-4 (Kharkiv)</p> <p>Utilization of waste heat in CHP-3 (Kharkiv)</p> <p>Energy efficiency (Kharkiv)</p> <p>Independent CHP (Lviv)</p> <p>Energy efficiency (Ternopil)</p>

Appendix A

List of Key Legislation

The following table provides an overview of the key legislation governing PPP in the municipal sector in the six countries.

Country	Key Legislation Governing PPP in the Municipal Sector
Bosnia and Herzegovina	<p>Law on Concessions of Bosnia and Herzegovina (Official Gazette of Bosnia and Herzegovina, nos. 32/02, 56/04)</p> <p>Law on Concessions of the Federation of Bosnia and Herzegovina (Official Gazette of the Federation of Bosnia and Herzegovina, nos. 40/02, 61/06)</p> <p>Law on Concessions of Republika Srpska (Official Gazette of Republika Srpska, no. 59/13)</p> <p>Law on Concessions of Brcko District (Official Gazette of Brcko District, nos. 41/06, 19/07, 2/08)</p> <p>Law on Public-Private Partnership of Republika Srpska (Official Gazette of Republika Srpska, nos. 59/09, 63/11)</p> <p>Law on Public-Private Partnership of Brcko District (Official Gazette of Brcko District, no. 10.07)</p> <p>Cantonal Laws on Concessions in Cantons of the Federation of Bosnia and Herzegovina</p> <p>Cantonal Laws on Public-Private Partnership in Cantons of the Federation of Bosnia and Herzegovina</p> <p>Set of Laws on Communal Activities</p>
Croatia	<p>PPP Act (Official Gazette, 78/12, 152/14)</p> <p>Concessions Act (Official Gazette, 143/12)</p> <p>Public Procurement Act (Official Gazette, 90/11, 83/13)</p> <p>Regulation on Implementation of Public-Private Partnership Projects (Official Gazette, 88/12, 15/15)</p> <p>Ordinance on the Organization and Keeping of the Register of Public-Private Partnership Contracts (Official Gazette, 16/13)</p> <p>Municipal Utilities Act (Official Gazette, 36/95, 70/97, 128/99, 57/00, 129/00, 59/01, 26/03, 82/04, 178/04, 38/09, 79/09, 49/11, 84/11, 90/11, 144/12, 94/13, 153/13)</p>
Kosovo	<p>Law on PPP (2011)</p> <p>Law on Public Procurement (2011)</p> <p>Law on Energy Regulator (2010), regulates tendering of IPP</p>
Mongolia	<p>State Policy on PPP (2009)</p> <p>Concession Law (2010, amended 2012)</p>
Serbia	<p>PPP Act (Official Gazette of the Republic of Serbia, no. 88/11)</p> <p>Public Procurement Act (Official Gazette of the Republic of Serbia, no. 124/12)</p> <p>Public Utilities Act (Official Gazette of the Republic of Serbia, no. 88/11)</p> <p>Construction and Spatial Planning Act (Official Gazette of the Republic of Serbia, nos. 72/09, 81/09, 64/10, 24/11, 121/12, 42/13, 50/13)</p> <p>Labor Act (Official Gazette of the Republic of Serbia, nos. 24/05, 61/05, 54/09, 32/13, 75/14)</p> <p>Civil Servants Act (Official Gazette of the Republic of Serbia, nos. 79/05, 81/05, 83/05, 64/07, 67/07, 116/08, 104/09, 99/14)</p> <p>Privatization Act (83/14)</p>
Ukraine	<p>Law on State-Private Partnership, the "PPP Law" (No. 2404-VI, 2010)</p> <p>Law on Lease and Concession of Municipal Central Water Supply, Heat Supply and Water Discharge Facilities (2010)</p>

The table below provides an overview of the key legislation governing the DH sector in the six countries.

Country	Key Legislation Governing the DH Sector
Bosnia and Herzegovina	<p>Law on Energy of Republika Srpska (Official Gazette of Republika Srpska, no. 49/09)</p> <p>Law on Energy Efficiency of Republika Srpska (Official Gazette of Republika Srpska, no. 59/13)</p> <p>Law on Renewable Energy Sources and Efficient Cogeneration, Republika Srpska (Official Gazette of Republika Srpska, nos. 39/13, 108/13)</p> <p>Law on Use of Renewable Energy Sources and Efficient Cogeneration, Federation of Bosnia and Herzegovina (Official Gazette of the Federation of Bosnia and Herzegovina, nos. 70/13, 5/14)</p> <p>Law on Communal Activities, Republika Srpska (Official Gazette of Republika Srpska, no. 124/11)</p> <p>Energy Strategy of Republika Srpska up to 2030</p> <p>Law on Local Self-Government (Official Gazette of Republika Srpska, nos. 101/04, 42/05, 118/05, 98/13)</p> <p>Law on the Principles of Local Self-Government of the Federation of Bosnia and Herzegovina (Official Gazette of the Federation of Bosnia and Herzegovina, nos. 49/06, 51/09)</p>
Croatia	<p>Energy Development Strategy for Croatia (Official Gazette, 130/09)</p> <p>Energy Act (Official Gazette, 120/12, 14/14)</p> <p>Act on Heat Energy Market (Official Gazette, 80/13, 14/14)</p> <p>Act on Regulation of Energy Activities (Official Gazette, 120/12)</p>
Kosovo	<p>Law on Energy (2010)</p> <p>Law on Energy Regulator (2010)</p> <p>Law on Central (District) Heating, under revision and awaiting government approval</p> <p>Law on Electricity</p>
Mongolia	<p>Energy Law (2001)</p> <p>Energy Sector Development Strategy (2002)</p> <p>Renewable Energy Law (2007)</p> <p>State Policy of Mongolia on Fuel and Energy (2008)</p>
Serbia	<p>Energy Law (Official Gazette of the Republic of Serbia, nos. 57/11, 80/11 – corrections 93/12, 124/12, and revised 29/12/2014)</p> <p>Law on the Efficient Use of Energy (Official Gazette of the Republic of Serbia, no. 25/13)</p> <p>Public Debt Law (Official Gazette of the Republic of Serbia, nos. 61/05, 107/09, 78/11)</p> <p>Draft Energy Sector Development Strategy of the Republic of Serbia for the period to 2025 with projections by 2030 (Ministry of Energy, June 2013)</p> <p>Regulation about incentives for privileged electricity producers</p> <p>Regulation about the method of calculation and manner of distribution of funds collected for fees for privileged electricity producers</p> <p>Regulation on the conditions and procedure of acquiring the status of privileged electricity producers</p>
Ukraine	<p>Law on Housing and Communal Services (No. 1875-IV, June 2004)</p> <p>Law on Heat Supply (No. 2633-IV, June 2005)</p> <p>Law on State Regulation of Communal Services (No. 2479-VI, July 2010)</p> <p>Law on “changes to certain laws of Ukraine regarding improvement of settlements for energy carriers” (No. 1198-VII, April 2014)</p> <p>Resolution of the Cabinet of Ministers on procedures to calculate tariffs for housing-and-municipal services (No. 869, June 2011)</p> <p>Resolution of the Cabinet of Ministers on rules for providing municipal services (No. 630, July 2005)</p> <p>Resolution of the Cabinet of Ministers on rules for recalculating the payments for municipal services in case of their improper quality / absence (No. 151, February 2010)</p>



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