MOGUĆNOSTI ZA ZELENE INVESTICIJE U SISTEMIMA DALJINSKOG GREJANJA U SRBIJI

DISTRICT HEATING SYSTEMS IN SERBIA - GREEN INVESTMENT OPTIONS

FORMIN.FINLAND.FI

EMBASSY OF FINLAND
BELGRADE

1+1=2 CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

MOGUĆNOSTI ZA ZELENE INVESTICIJE U SISTEMIMA DALJINSKOG GREJANJA U SRBIJI

DISTRICT HEATING SYSTEMS IN SERBIA - GREEN INVESTMENT OPTIONS

REZIME

Pružanje usluge daljinskog grejanja u Srbiji može se obavljati na način koji će koristiti svim zainteresovanim stranama. Investitori i vlasnici preduzeća koja pružaju ovu uslugu mogu ostvarivati održivi profit. Korisnici usluge mogu uživati u pouzdanoj, kvalitetnoj, jeftinoj i pristupačnoj usluzi. Lokalne samouprave ne moraju da brinu o posledicama pružanja ove usluge na budžet i ne moraju da strahuju od tehničkih ili finansijskih kolapsa javnih preduzeća koja pružaju ovu uslugu, sa moguće ozbiljnim posledicama po stanovništvo i društvenu klimu na lokalu. Vlada Republike Srbije može da bolje planira i bolje upravlja svojom imovinom u energetskom sektoru ne brinući o posledicama koje loš kvalitet daljinskog grejanja uzrokuje u ostalim delovima energetskog sistema Srbije, i može da uživa u blagodetima smanjenog trgovinskog deficita ili povećane dodate vrednosti u privredi usled boljeg korišćenja kvalitetnih energenata. Projekti uvođenja obnovljivih izvora u sisteme daljinskog grejanja sprovedeni u sadejstvu sa unapređenjem energetske efikasnosti uređaja za korišćenje ogrevnog drveta u domaćinstvima mogu ključno doprineti ispunjenju nacionalnih ciljeva u oblasti energetske efikasonsti i obnovljivih izvora energije. Konačno, ali ne i najmanje bitno, svi građani Republike Srbije mogu da osete blagodeti unapređenog kvaliteta životne sredine i smanje rizik klimatskih promena putem smanjenja emisija gasova sa efektom staklene bašte, kao i da prestanu da budu nevoljni sufinansijeri usluge tudjeg daljinskog grejanja.

Ostvarenje ove vizije je moguće danas, kada se udruže raspoloživi resursi za unapređenje usluge daljinskog grejanja u Srbiji: lokalno raposloživi obnovljivi izvori energije, otpadna toplota[1], lokalno raspoloživo tehničko i organizaciono znanje, najbolje dostupne globalne tehnologije i raspoloživi kapital.

Drvna biomasa je resurs čije korišćenje predstavlja neophodan preduslov za dostizanje cilja: održive, komercijalne usluge daljinskog grejanja. Kako je biomasa u velikom broj slučajeva raspoloživa u blizini lokacija na kojima se nalaze toplane i moguće je dopremiti je uz minimalne transportne troškove, izabrana tehnologija mora da omogući korišćenje biomase u jeftinijim oblicima, pre svega u obliku drvne sečke.

Unapređenje upravljanja distribucijom i isporukom toplote je neophodan preduslov uvođenju novih izvora toplote u sistem. Potrebna unapređenja u distribuciji i i isporuci toplote mogu u roku od dve godine od početka sprovođenja mera unapređenja omogućiti promenu goriva koje se sada koristi u toplotnom izvoru.

Komercijalno pružanje pristupačne usluge daljinskog grejanja uz korišćenje drvne biomase je moguće u Srbiji sa postojećim tehnologijama, raspoloživim lokalnim znanjem, u postojećem pravnom okviru i sa postojećim raspoloživim resursom. Potrebno je donošenje odluka i osnaživanje aktera u javnom sektoru za sprovođenje promene kao i podrška uspostavljanju stabilnog lanca snabdevanja. Modeli za pružanje te podrške postoje, kao i volja da se ta podrška pruži. Ekonomija obima je od značaja za smanjenje troška ove promene pa je saradnja između lokalnih samouprava neophodna da bi se ona ostvarila. Organizacije civilnog društva, kako strukovne, tako i udruženja građana, mogu značajno doprineti da tražnja za pristupačnim, održivim opcijama grejanja sa blagodetnim posledicama na životnu sredinu, postane stvarna.

Daljinsko grejanje u Srbiji može izaći na „zelenu granu“ korišćenjem „zelenih“ tehnologija. Bez investicija u nove tehnologije proizvodnje toplotne energije zasnovane na obnovljivim izvorima energije, u sistemima daljinskog grejanja u Srbiji neće biti moguće razrešiti probleme koji su doveli do toga da sistemi daljinskog grejanja u Srbiji u 2013. godini duguju snabdevačima goriva oko 350 miliona eura, iznos približno jednak godišnjem trošku za gorivo svih sistema, i potražuju od svojih korisnika preko 200 miliona.

[1] Gradovi koji se nalaze u blizini postojećih velikih termoenergetskih objekata se sa današnjom tehnologijom mogu uspešno grejati korištenjem otpadne toplote iz ovih objekata. Beograd je najznačajniji primer.

SUMMARY

District heating provision in Serbia can be beneficial for all the interested parties. Investors and the owners of the companies which provide this service can make a sustainable profit. It can be provided to customers as a reliable, quality, cheap and an accessible service. Local government does not need to take care of the budget consequences of providing this service and also does not need to be in dare of technical or financial collapses of the public companies which provide this service, with possibly serious consequences for population and local society. The Serbian Government can make better plans and can better manage its assets in the energy sector not taking care of the consequences which can be arisen by bad quality of the district heating in the rest of the energy system of Serbia, and can benefit from the reduced trade deficit or increased value added in economy due to better using of the quality energy. Introducing projects of renewable sources in district heating systems, implemented in conjunction with improvement of energy efficiency devices for use of firewood in households, can contribute to the accomplishment of national goals in the area of energy efficiency and renewable energy sources. Last but not least, all of the citizens of the Republic of Serbia can benefit from the improved quality of environment and from reduced risk of climate change due to reducing GHG (Greenhouse Gas) emission, as well as to stop being unwilling co-financiers of the service of district heating of other people.

The achieving of this vision is possible when available resources for providing improved service of district heating in Serbia are brought together: locally available renewable energy, waste heat[1], locally available technical and organizational knowledge, the best available global technologies and the available capital.

Wood biomass is a resource which use is necessary precondition for accomplishing the goal: sustainable, commercial services of district heating. As the biomass is mostly located near heating plants and it is possible to be delivered at minimal expenses, chosen technology has to enable the cheaper use of biomass, mainly wood chips.

The improvement of heat distribution and delivery management is necessary precondition for the implementation of new heat sources in the system. The necessary improvements in distribution and delivery of heating in the period of two years from the start of implementation of measures can enable the change of fuel which is used in heating.

The commercial provision of accessible service of district heating based on the use of wood biomass is possible in Serbia with available technologies, available local knowledge, in the current legal framework and with the available resources. The decision-making process, the empowerment of the people for undergoing changes in the public sector and the support in establishing the supply chain are all necessary. Models for providing the support exist as well as the will for providing that support. The economies of scale are important for cost reduction of this change so the collaboration among the local governments is necessary for its accomplishment. The organizations of civil society, professional associations as well as citizens associations, can significantly contribute to making the demand for accessible, sustainable heating options with beneficial consequences for the environment, realistic.

The district heating in Serbia can be on the "green branch" by using the "green" technologies. Without investing in new technology for heat production or use, based on renewable energy, in the district heating systems in Serbia it is not going to be possible to solve problems which led to the fact that the district heating systems in Serbia in 2013 owe about €350 million to the fuel suppliers, the amount which is approximately equal to the annual fuel cost of the all systems, and claim more than 200 million from their customers.

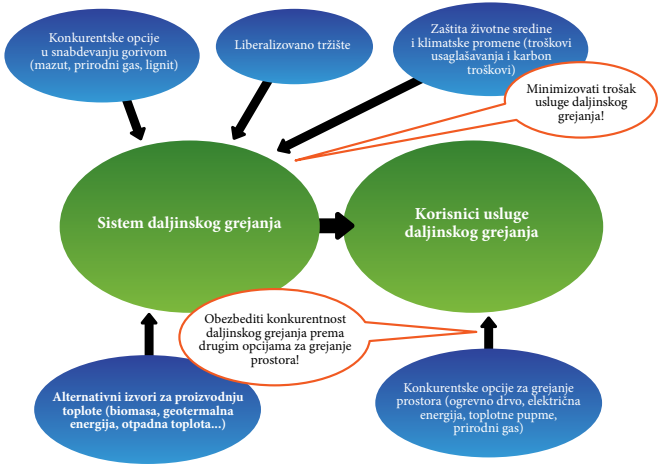
[1] Cities that are close to the existing large thermal power facilities could be successfully heated using waste heat from these facilities with the current technology. City of Belgrade is the most important example.

UVOD

Šta podrazumevamo pod pojmom daljinskog grejanja? Prema evropskom udruženju nacionalnih udruženja za daljinsko grejanje, Euroheat & Power„...daljinsko grejanje je pogodan način za grejanje prostora i potrošne tople vode. U mnogim procesima, na primer u procesu proizvodnje električne energije ili pri sagorevanju otpada, velike količine energije se oslobađaju u obliku otpadne toplote. Osnovna ideja vodilja za moderne sisteme daljinskog grejanja je iskorištavanje ove toplote koja bi inače bila izgubljena - iz proizvodnje električne energije, iz procesa rafinacije goriva i biogoriva kao i iz drugih industrijskih procesa. Daljinsko grejanje takođe može da omogući korištenje obnovljivih izvora energije kao što su biomasa, geotermalna ili sunčeva energija[2].“

Daljinsko grejanje u Srbiji se ne zasniva na ovoj jednostavnoj ideji vodilji: u Srbiji se radi „proizvodnje“ toplote spaljuju komercijalna goriva – prirodni gas, mazut, ugalj.

Ko su zainteresovane strane u lancu pružanja usluge daljinskog grejanja u Srbiji? Kakva su njihova očekivanja i njihove mogućnosti da utiču na prirodu ove usluge? U kakvom konkurentskom okruženju se obavlja ova usluga?



Grafikon 1. Daljinsko grejanje i uticaji iz okruženja. Prema: Benchmarking district heating in Hungary, Poland, Lithuania, Estonia and Finland.April 2011. ERRA and Fortum

Minimiziranje troškova usluga daljinskog grejanja je jedini način da ova usluga opstane na tržištu usluga grejanja prostora. Ta minimizacija nije moguća bez promene u načinu proizvodnje toplote koji podrazumeva i uvođenje drvne biomase kao goriva u sisteme daljinskog grejanja.

[2] http://www.euroheat.org/District-heating-cooling-4.aspx#What_is_District_Heating

INTRODUCTION

What is meant by district heating? According to Euroheat & Power: "District heating is a convenient way to heating space and tap water. In many processes, for example when electricity is generated or waste is burned, large parts of the energy are set free in the form of surplus heat. The fundamental idea behind modern district heating is to recycle this surplus heat which otherwise would be wasted- from electricity production, from fuel and biofuel-refining, and from different industrial processes. Furthermore, district heating can make use of the many kinds of renewables (biomass, geothermal, solar thermal)[2]."

District heating in Serbia is not based on this simple guiding idea: Commercial fuels such as natural gas, mazut and coal are burnt in order to “produce” heat.

Who are interested parties for district heating provision in Serbia? What are their expectations and their opportunitiesto affect this service? In what kind of competitive environment is this service provided?

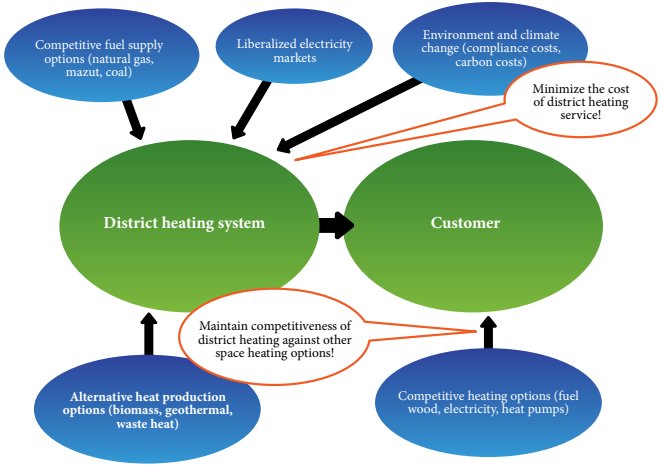


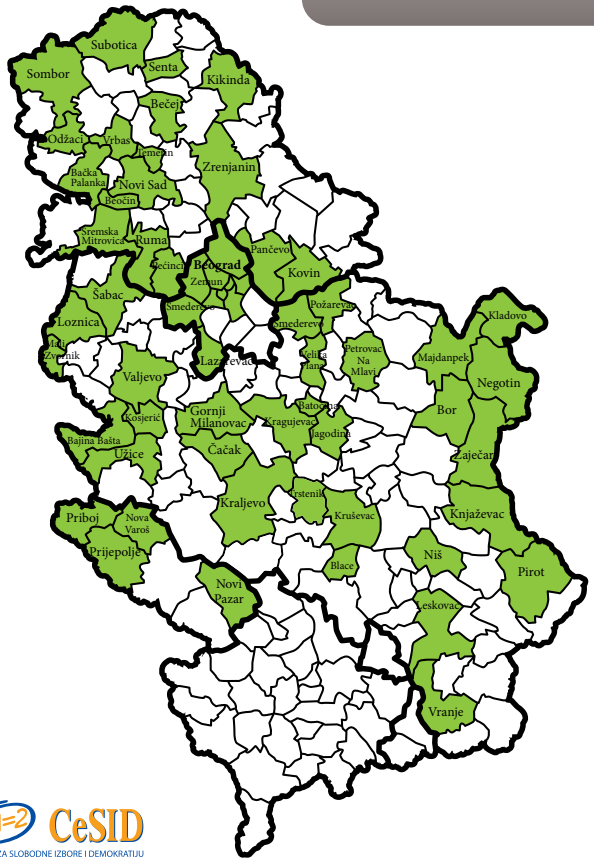
Figure 1. District heating system in the external environment. According to :Benchmarking district heating in Hungary, Poland, Lithuania, Estonia and Finland.April 2011. ERRA and Fortum

Minimizing the cost of district heating service is the only way to maintain on the market of space heating service. It is not possible without changes in the way in which the heat is produced including implementation of wood biomass as fuel in the district heating systems.

[2] http://www.euroheat.org/District-heating-cooling-4.aspx#What_is_District_Heating

DALJINSKO GREJANJE U SRBIJI[3]

OPŠTINE U SRBIJI SA SISTEMOM DALJNISKOG GREJANJA



Grafikon 2. Opštine u Srbiji sa sistemima daljinskog grejanja

[3] Prema Udruženju toplana Srbije.

DISTRICT HEATING IN SERBIA[3]

MUNICIPALITIES IN SERBIA WITH DISTRICT HEATING SYSTEM

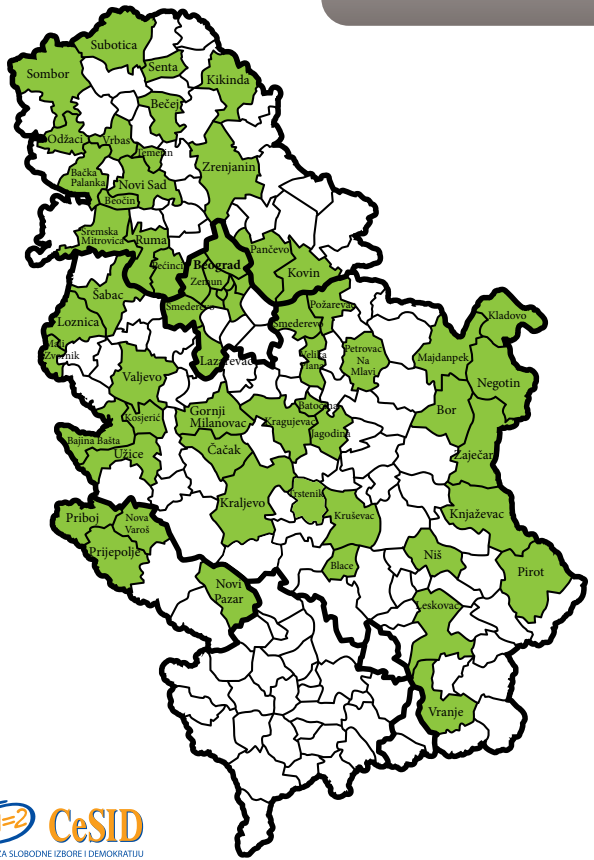


Figure 2. Municipalities in Serbia with district heating systems

[3] According to the Association of District Heating Systems in Serbia

Tabela 1. Osnovni podaci o centralizovanim sistemima snabdevanja toplotnom energijom[4]

Podatak	Jedin. mere	Količina
Ukupan broj stanova u Republici Srbiji	-	2,956,516
Površina stanova u Republici Srbiji	m2	200,091,852
Broj stanova sa instalacijama CG	-	792,346
Broj stanova priključenih na toplane	-	572,089
Ukupna površina stanova priključenih na toplane	m2	28,847,975
Ukupna površina ostalih ustanova i poslovnih jedinica priključenih na toplane	m2	9,118,583
Ukupna površina stanova i poslovnih objekata priključenih na toplane	m2	37,504,987
Udeo stanova sa instalacijama CG u odnosu na ukupan broj stanova	%	27.8
Udeo stanova priključenih na toplane u odnosu na ukupan broj stanova	%	19.4
Broj toplana	-	299
Broj kotlova	-	692
Kapacitet kotlova	MWт	6,587
Priključena snaga potrošača	MWт	5,799
Godišnja potrošnja goriva toe	toe	648,017
Dužina toplovodne mreže	km	1,289
Ukupan broj podstanica	-	15,902
Broj podstanica u stambenim zgradama	-	9,928

PROIZVODNJA (PREUZIMANJE) TOPLOTE

Sistemi daljinskog grejanja u Srbiji počivaju na procesu u kome se toplota sagorevanja fosilnih goriva predaje putem izmenjivača toplote distributivnom sistemu kojim se ona dalje doprema do potrošača. Toplotom sagorevanja fosilnih goriva greje se voda do temperature koja u najhladnijim režimima prelazi i 100 stepeni te se u ovom procesu gubi ogroman deo maksimalnog korisnog rada koji je bilo moguće izvršiti ovom energijom. *Na taj način je veći deo energetskog i ekonomskog potencijala sadržanog u ovom gorivu nepovratno izgubljen.*

Preko 90% proizvodnje toplotne energije u sistemima daljinskog grejanja u Srbiji zasnovano je na direktnom korišćenju fosilnih goriva. To je proces u kome se energija sagorevanja fosilnih goriva preda velikoj masi vode koja prenosi toplotu do korisnika sistema bez istovremene proizvodnje električne energije ili industrijske pare. Direktno korišćenje fosilnih goriva zaslužno je za svega 15% proizvodnje toplotne energije u sistemima daljinskog grejanja u 27 zemalja Evropske unije.

Način na koji se toplotna energija u Srbiji proizvodi, ne omogućava održivost ove usluge.

Proizvodnja toplotne energije se obavlja u relativno velikim kotlovskim jedinicama. Ove jedinice su projektovane tako da omoguće da se najudaljenijem potrošaču u najhladnijem danu isporuči optimalna količina toplote. Sistemi su projektovani za temperature koje su niže od ostvarenih zimskih temperatura, pa je instalisana snaga grejnih tela na strani potrošnje prevelika, što je uzrokovalo i dodatno povećanje projektovane snage kotlova. Rezultat je nisko korištenje kotlovskih

[4] (Program ostvarivanja strategije energetike Republike Srbije do 2015 godine za period od 2007 do 2012 godine, 2009)

Table 1. Basic data on district heating in Serbia[4]

Data	Unit of measure	Quantity
Total number of apartments in the Republic of Serbia	-	2,956,516
Total surface of the apartments	m2	200,091,852
Number of the apartments with central heating installations	-	792,346
Number of apartments connected to the district heating systems	-	572,089
Total surface of the apartments connected to the district heating system	m2	28,847,975
Total surface of other facilities and commercial units connected to the district heating system	m2	9,118,583
Total surface of the apartments and commercial units connected to the district heating system	m2	37,504,987
Share of the apartments with the central heating installations in the total number of the apartments	%	27.8
Share of the apartments connected to the district heating systems in the total number of the apartments	%	19.4
Number of heating plants	-	299
Number of boilers	-	692
Boiler capacity	MWтh	6,587
Heating consumption capacity	MWтh	5,799
Annual fuel consumption	toe	648,017
Total length of distribution network	km	1,289
Total number of substations	-	15,902
Total number of substations in residential buildings	-	9,928

HEAT PRODUCTION

District heating systems in Serbia are based on the process in which the heat from the combustion of fossil fuel is delivered through heat exchangers to the distribution system by which it is further delivered to consumers. Heat from the combustion of fossil fuel heats the water to the temperature which exceeds 100 degree in the coldest regimes wasting the opportunity to achieve maximum disposable work. Thereby the bigger part of energy and economic potential included in this fuel are irreversibly lost.

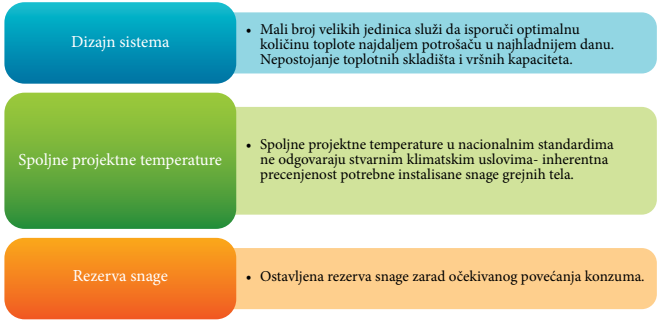
More than 90% of production of thermal energy in district heating systems in Serbia is based on the direct use of fossil fuel. It is a process in which the energy of combustion of fossil fuel is delivered to the large amount of water which delivers heat to system consumers without electricity generation at the same time. The direct use of fossil fuel accounts for only 15% of production of thermal energy in district heating systems in 27 European countries.

Current heat production in Serbia is not sustainable.

The production of thermal energy is done in large boiler units. These units are designed in the way that they can provide the optimal amount of heat to the farthest consumer in the coldest day. The systems are designed for lower temperatures than the temperatures in winter are, so the installed consumption capacity is very high, which caused an additional increase of boiler's designed power. It results in the low utilization of boiler's capacity, i.e. worse usage of asset, as well as the boiler's

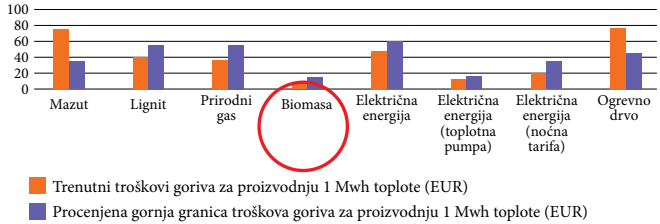
[4] Source: Programme for realization of Energy strategy of the Republic of Serbia till 2015 for the period from 2008 till 2012

kapaciteta, odnosno loše korištenje imovine, kao i rad kotlova izvan optimalnih režima efikasnosti i u stani-kreni režimu. Godišnje korištenje kapaciteta je u rasponu od 1,000 do 1,500 ekvivalentnih sati[5]. Sistemi daljinskog grejanja nisu u stanju da kapitalne troškove svog poslovanja plaćaju iz poslovnih prihoda. Budžeti lokalnih samouprava su najčešće izvor pokrivanja ovih troškova čime su građani koji nisu korisnici usluge daljinskog grejanja stavljani u položaj da sufinansiraju ovu uslugu.



Grafikon 3. Razlozi za nizak stepen utilizacije kotlova

Troškovi goriva za proizvodnju 1 MWh toplotne energije su visoki.



Grafikon 4. Trenutni troškovi i procenjene gornje granice troškova proizvodnje 1 MWh toplote u Srbiji.

Gorivo	Količina
Prirodni gas	320,000,000 sm3
Mazut	150,000,000 kg
Lignit	200,000,000 kg

Tabela 2. Potrošnja goriva po vrstama goriva u sistemima daljinskog grejanja u Srbiji

[5] Računato kao količnik energije isporučene na pragu toplane i maksimalno instalisane snage toplane.

functioning outside its optimal efficient mode and in stop-start mode. The annual use of capacity ranges between 1000 and 1500 equivalent hours[5]. District heating systems are not able to pay their capital costs from the business incomes. The budgets of local governments were the financial source covering these costs, which put the populationnot using this service of district heating in the co-financing position.

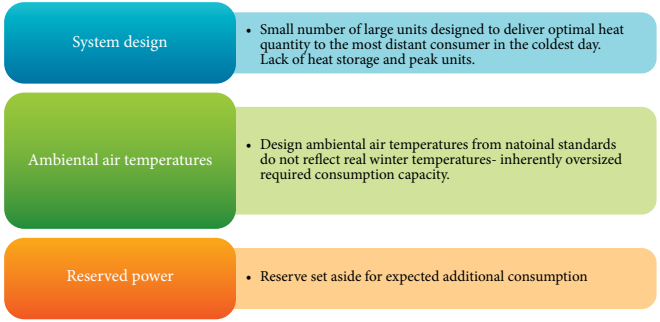


Figure 3. Drivers of low utilization rates

Fuel costs for production of 1 MWh of heat are high.

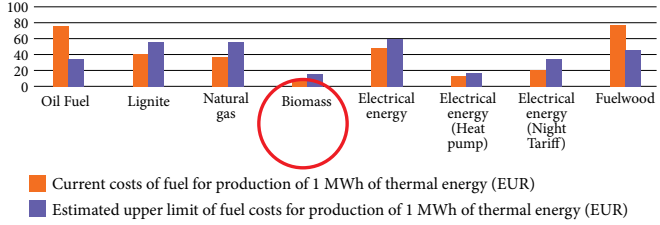


Figure 4. Fuel costs for production of 1 MWh thermal energy, Source: Prefeasibility assessment of biomass district heating system applications in Serbia. IRG 2012

Fuel	Quantity
Natural gas	320,000,000 sm3
Mazut	150,000,000 kg
Lignite	200,000,000 kg

Table 2. Annual fuel consumption in district heating systems in Serbia

[5] Calculated as ratio between energy delivered at the plant threshold and total plant capacity

Sistemi daljinskog grejanja u Srbiji troše prirodni gas, mazut, lignit i zanemarljivu količinu drugih goriva. Udeli prirodnog gasa i mazuta se menjaju iz godine u godinu budući da izvestan broj sistema može da koristi i jedno i drugo gorivo. Izbor goriva je uglavnom zasnovan na uslovima plaćanja, trenutnom paritetu cena i raspoloživosti goriva. Poslednjih godina su ovi faktori diktirali povećanje potrošnje prirodnog gasa osim u danima kada je snabdevanje ovim energentom bilo nestabilno.

Specifičnosti tržišta gasa u Srbiji:
- Visoki troškovi tranzita kroz Mađarsku
- Zimska potrošnja veća od letnje čak 6 puta!
- Preko 60% dnevnih količina koje se isporučuju u zimskom periodu u doba niskih temperatura odlazi toplanama.
- Dugovanja korisnika prema Srbijagasu iznose više od 700 miliona evra.

Srbija se snabdeva **prirodnim gasom** iz Ruske Federacije. Jedini pravac snabdevanja vodi preko Mađarske. Na tom pravcu snabdevanja Srbija je poslednji iole značajniji potrošač. Kako su sistemi daljinskog grejanja, naročito u zimskim mesecima, najveći potrošači gasa, svaka nešto hladnija zima ugrožava sigurnost snabdevanja. Ukoliko se bilo gde duž gasovoda prema izvoru snabdevanja dešavaju restrikcije ili havarije ova sigurnost snabdevanja biva dodatno narušena. Sa izgradnjom podzemnog skladišta gasa u Banatskom dvoru sigurnost snabdevanja je poboljšana uz dodatne troškove kompresora, skladištenja i finansiranja zaliha. U ovakvoj tržišnoj situaciji trošak izgradnje ovog skladišta je zapravo trošak koji se može pripisati sistemima daljinskog grejanja, budući da podzemno skladište gasa na ovakvom gasnom tržištu ima ulogu skladišta toplote. Skladišta toplote je međutim moguće izgraditi po daleko nižim cenama.

Mazut koji koriste sistemi daljinskog grejanja u Srbiji se proizvodi u Naftnoj Industriji Srbije.

Kupovina mazuta je sve veći problem za sisteme daljinskog grejanja. Mazut se isporučuje samo nakon avansnog plaćanja ili uz pružene bankarske garancije. Preduzeća koja upravljaju sistemima daljinskog grejanja obično nisu u mogućnosti ni da izvrše avanasno plaćanje ni da pruže bankarsku garanciju pa se sve češće obraćaju Republičkoj direkciji za robne rezerve kao isporučiocu mazuta koji postaje poverilac sistemima daljinskog grejanja. Na taj način se troškovi obavljanja ove usluge još jednom prebacuju i na građane koji je ne koriste.

- Naftna Industrija Srbije nudi u svom asortimanu ulje za loženje-takozvani mazut S i niskosumporno gorivo- specijalni mazut NSGS. Mazut koji ima viši sadržaj sumpora izazivao je probleme u zemljama u kojima je korišten u slučajevima kada kotao radi u radnim režimima sa nižim temperaturama. U takvim režimima može doći do procesa koji vode stvaranju kiseline i razaranju delova kotla. Mere kojima se pokušava sprečavanje ove pojave smanjuju efikasnost rada kotla i imaju upitnu učinkovitost.

Sušeni ili sirovi lignit se koristi u nekim sistemima daljinskog grejanja u Srbiji. Njegovo korištenje se uglavnom posmatra u negativnom kontekstu zbog uticaja na lokalnu životnu sredinu. Propisi iz oblasti zaštite životne sredine koji imaju za cilj smanjenje negativnih uticaja iz industrijskih procesa na zdravlje stanovništva i stanje životne sredine koje Srbija ubrzano usvaja u procesu pristupanja Evropskoj uniji ograničavaju emisije sumpor dioksida, azotnih oksida i čestica iz inudstrijskih postrojenja. Toplane koje sagorevaju lignit ne bi bile u mogućnosti da na ekonomski prihvatljiv način ispune ove norme namenjene zaštiti zdravlja i imovine građana. Troškovi emisija CO_2 će u nekom obliku u srednjeročnom periodu sasvim sigurno biti pridruženi troškovima koje toplane imaju. U slučajevima kada toplane sagorevaju lignit taj bi trošak mogao biti značajan.

District heating systems in Serbia use natural gas, mazut, lignite and negligible amount of other fuels. The uses of natural gas and mazut change year after year as some systems can use both of these fuels. The choice of fuel is chiefly based on terms of payment, the current costs parity and fuel availability. In recent years these factors caused the increase of the natural gas use, except for the days when the supply of this fuel was unstable.

Specifies of the gas market in Serbia:
- High costs of transit through Hungary
- Winter consumption 6 times higher than summer consumption
- Heating plants' consumption accounts for more than 60% of daily amounts delivered in winter in the period of low temperatures
- Srbijagas is owed more than €700 million by the consumers

The Russian Federation supplies Serbia with **natural gas.** The only supply pipe goes through Hungary. In this supply direction Serbia is the last significant consumer. As the district heating systems are the biggest users of natural gas, especially in winters, the security of supply is jeopardized during every colder winter. If restrictions or breakdown happen, somewhere in gas pipeline towards the source of supplying, this security of supply will be additionally decreased. The construction of underground gas storage in BanatskiDvor increased the security of supply with additional costs for compressing, storage and stock financing. In this market situation the cost of building of this storage is actually the cost which can be assigned to the district heating systems, as the underground gas storage on this market has the role of heat storage. However, the heat storage could be built at much lower costs.

Mazut which is used by district heating systems in Serbia is produced as a by-product of refining in Oil industry of Serbia (NIS).

Purchasing of mazut is a growing problem for district heating systems. Mazut is delivered only after an advance payment or when banks guarantees are provided. Companies which manage district heating systems are not able to accomplish advance payment or to provide banks guarantee, so they more often contact Republican Directorate for Commodity Reserves as the distributor of mazut which becomes a creditor for district heating systems. Accordingly, the costs of this service are again assigned to the people who do not use it.

- NIS provides heating oil - so called mazut S and low sulphur fuel - specialmazut NSGS. Mazut which has higher amount of sulphur caused problems in the countries which use it when the boiler works in modes of lower temperatures. ACid can be formed in these modes leading to boiler damage. Measures used to stop this process decrease the efficiency of boiler and have questionable effectiveness.

Dried or row lignite is used in some district heating systems in Serbia. It is considered negatively due to the harmful effect on the environment. Regulations of environmental protection, which goals are reducing the negative impact of industry on health and environment state and which Serbia rapidly adopts in the EU accession process, restricts SO2 and NOx emissions and solid particles. The heating plants, which burn lignite, would not be able to meet the standards of health protection and property of citizens, economically. The costs of CO2 emission will be assigned to the heating plants costs in medium-term. If the heating plants use lignite, that cost would be significant.

DISTRIBUCIJA I ISPORUKA TOPLOTE

Način na koji se toplotna energija distribuira i isporučuje ne omogućava održivost ove usluge. Starost sistema daljinskog grejanja u Srbiji određuje kako njegove tehnološke karakteristike tako i operativne karakteristike. Dodatni faktor koji je uticao na izgled i funkcionisanje sistema daljinskog grejanja u Srbiji je činjenica da su ovi sistemi građeni fazno bez jedinstvenog projekta i bez integralnih energetskih, masenih i hidrauličkih proračuna. Starost sistema je uzrokovala i primenjeni način regulacije.

Tabela 3. Starost mreža distribucije toplote i mreža podstanica u sistemima daljinskog grejanja u Srbiji[6]

Starost distributivne mreže	Udeo	Starost podstanica	Udeo
Godine	%	**Godine**	%
Više od 30	18	Više od 30	9
20–30	38	20–30	48
10–20	30	10–20	30
Manje od 10	14	Manje od 10	13

Regulacija isporuke toplote se obavlja varijacijom temperature u odlaznom vodu, odnosno kvalitativnom regulacijom (regulacija sa konstantnim protokom). Ovakva vrsta regulacije može dobro da funkcioniše samo u uslovima kada je primarna mreža precizno hidraulički uravnotežena, što nije slučaj, budući da je mreža građena i projektovana sukcesivno kao i zbog činjenice da su elementi koji su služili za redukciju pritiska i ograničenje protoka u podstanicama uglavnom van funkcije. Kao posledicu imamo rasipanje toplote i povećanu potrošnju energije na izvoru da bi se zadovoljio kvalitet isporuke u pojedinim tačkama mreže. Kvalitativna regulacija takođe ne omogućava da temperatura vode u svim tačkama sistema bude u isto vreme jednaka budući da su moguća kašnjenja i do jednog sata usled transporta toplote kroz sistem. Trenutno preovlađujući nominalni režimi u vrelovodnim sistemima daljinskog grejanja su 120/80 0C u sistemu i 90/70 0C u kućnim instalacijama. Valja primetiti da ovako visoko-temperaturni režimi znače velike gubitke u eksergiji i da je neophodno obezbediti prelazak na režime sa nižim temperaturama. U jednom broju slučajeva to svakako zahteva intervenciju na energetskoj efikasnosti objekata.

Neoptimizovana distribucija i isporuka toplote u Srbiji je jedan od problema koji utiču na neefikasnost distribucije i isporuke toplotne energije. Potrebna je modernizacija podstanica u sistemima daljinskog grejanja u Srbiji kako bi se omogućilo uvođenje regulacije putem promenljivog protoka, odnosno kvantitativne regulacije. Ovakva vrsta regulacije bi omogućila značajne uštede koje mogu dosegnuti i do 15% ukupno potrebne energije za optimalno grejanje konzuma[7].

Gubici u distrubuciji toplotne energije postoje i usled lošeg stanja distributivnih mreža sa velikim curenjima vode i nedovoljnom izolacijom. Sistemi daljinskog grejanja u Finskoj se dopunjuju vodom u proseku jednom u toku sezone. Sistemi daljinskog grejanja u Srbiji se dopunjuju od nekoliko puta godišnje do nekoliko desetina puta godišnje. Nekoliko sistema daljinskog grejanja u Srbiji ima curenje koje je na nivou najboljih evropskih standarda.

[6] (Program ostvarivanja strategije energetike Republike Srbije do 2015 godine za period od 2007 do 2012 godine, 2009)

[7] Važno je napomenuti da se ovde radi o računskoj veličini. Usled navedenih razloga i problema sa likvidnošću preduzeća stvarno isporučena toplota može biti i manja i veća od te veličine što samo delimično utiče na kvalitet isporuke.

HEAT DISTRIBUTION AND DELIVERY

Current heat distribution and delivery are not sustainable. The age of district heating system in Serbia specifies its technical and operative characteristics. An additional factor which had impact on appearance and functioning of district heating system in Serbia is the fact that these systems were built in phases without integral design and without integral energy, mass and hydraulic calculation. The age of system caused also the current method of regulation.

Table 3. Age of pipes and subtstations in the district heating networks in Serbia[6]

Age of distributoin networks	Share	Age of substations	Share
Age	%	**Age**	%
More than 30	18	More than 30	9
20–30	38	20–30	48
10–20	30	10–20	30
Less than 10	14	Less than 10	13

The heat delivery regulation is done by the variation of temperature in direct pipe, i.e. qualitative regulation (regulation with constant flow). This kind of regulation can function well only in the conditions of precisely hydraulically balanced primary network, which is not the case due to the successively building and designing of the network as well as due to the fact that the elements which were used for pressure reduction and flow limitation are out of function. The consequence is heat dissipation and increased consumption of energy, in order to fulfil the quality of delivery in some points of network. The qualitative regulation does not enable equal water temperature in the whole system at the same time as the one hour delays in transportation of heat through the system are possible. Current nominal regimes in hot water district heating systems are 120/80 0C in the system and 90/70 0C in the home installations. These high-temperature regimes mean large exergy deficit and the need to shift to the low-temperature regimes. In some cases that means the intervention on energy efficiency of buildings.

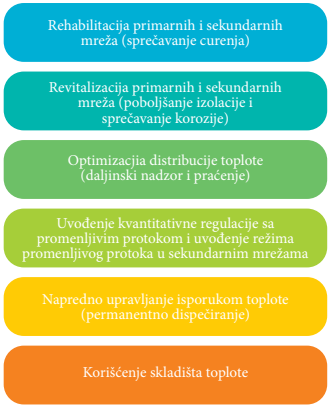
Problem of non-optimized distribution and delivery of heat in Serbia is one of the problems which have an impact on ineffective distribution and delivery of heating energy. The modernization of substations in district heating systems in Serbia is necessary in order to introduce regulations with-variable flow, i.e. quantitative regulation. This kind of regulation can enable significant savings which reach 15% of total energy required for optimal heating of consumers[7].

Heat distribution losses are also caused by the poor conditions of the networks with severe leakages and poor thermal insulation. Systems in Finland are refilled once a year while district heating systems in Serbia are refilled from several times a year to several dozens of time annually. Some systems in Serbia do have leakages comparable to the European standards.

[6] Programme for realization of the Energy strategy of the Republic of Serbia till 2015 for the period from 2007 till 2012

[7] This is just a calculation. Real energy delivered could be both larger and smaller than this figure due to the liquidity problems. This affects the quality of service.

Način na koji se toplota distribuira i isporučuje utiče na kvailtet i sigurnost usluge kao i na ukupne troškove obavljanja usluge, ali takođe kritično utiče i na moguću primenu proizvodnje toplote na toplotnom izvoru.



Grafikon 5. Mere za povećanje energetske efikasnosti i smanjenje emisija gasova sa efektom staklene bašte u isporuci toplote

Za sprovođenje čitavog skupa mera za unapređenje efikasnosti u distribuciji toplote potrebno je oko 6 godina stalnog i upornog poboljšanja. Zamena toplotnog izvora bi međutim mogla biti moguća već od trenutka kada je obezbeđena kvantitativna regulacija i time stvorene mogućnosti za korišćenje nižih temperaturnih režima i moguću upotrebu kondenzacionih kotlova u ovim sistemima.

Merenje isporučene energije je potrebno radi optimizacije sistema. Razlog postojanja sistema daljinskog grejanja je efikasnost i konkurentnost u odnosu na druge mogućnosti za grejanje prostora, koja iz te efikasnosti proističe. Prvi i najvažniji razlog za sprovođenje merenja je informacija koju ponuđač usluge daljinskog grejanja dobija o ponašanju svojih korisnika. Ta informacija omogućuje da daljinsko grejnaje bude optimizovano i efikasno, **što je neophodan uslov za opstanak ove usluge u okruženju drugih vidova grejanja prostora.** Preduzeće koje obavlja uslugu daljinskog grejanja može meriti toplotu koja se predaje iz njegovih postrojenja u mrežu i to se danas čini gotovo svuda u Evropi pa i u Srbiji. Na taj način se stvara informacija o proizvodnji.

Merenje na tačkama predaje, u podstanicama kod korisnika omogućava informaciju o tome gde završava proizvedena energija, i kao što je napred napomenuto, daje informaciju o navikama korisnika u korištenju usluge. Ovo merenje može poslužiti kao osnova za naplatu usluge. Informacija o potrošenoj energiji je svakako važna i za korisnika i za njegovu mogućnost da upravlja svojom potrošnjom.

Takođe, moguće je izvršiti merenje potrošnje kod krajnjih potrošača koji su grupno povezani na tačku isporuke toplote (podstanicu) kako bi se izvršila pravična raspodela troška. Ova vrsta raspodele (pod-merenje ili submetering kako se u literaturi često naziva) se može obaviti stvarnim

Current heat distribution and delivery have an impact on quality and security of service as well as on the overall costs, and also have critical impact on possible application to the heat source.

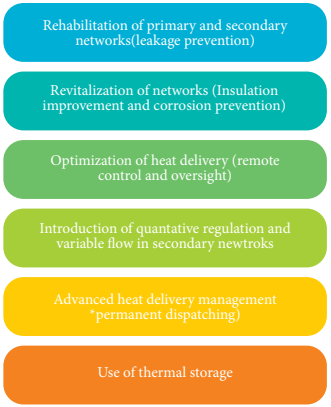


Figure 5. Measures for improvements of heat delivery efficiency

Six years of constant and persistent improvements are needed for implementation of all measures for efficiency improvement in heat distribution. The replacement of heat source could be possible when of quantitative regulation is introduced facilitating usage of the low-temperature regimes well as the use of condensing boilers in these systems.

The delivered energy metering is necessary for system optimization. The reason for existence of district heating system is efficiency and competition in relation to other possibilities for space heating, which is derived from that efficiency. The first and the most essential reason for metering implementation is the information which district heating service provider gets about the consumers. That information provides the optimization and efficiency of district heating, **which is essential condition for the survival of this service among other optionsfor space heating.** A district heating company can measure the heat which is delivered from its plant to the network and today it is done almost everywhere in Europe and also in Serbia. Accordingly, the information about the production is obtained.

Meters on delivery points, in consumers' substations provide the information about the destination of produced energy, and as it has already been said, provide the information about the consumers' behaviour. Billing of the service could be based on this metering. The information about energy consumption is important for the consumer as well as for their ability to manage the consumption.

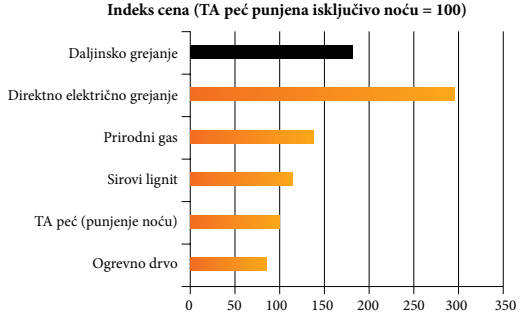
It is also possible to measure the final consumers' consumption when they are jointly connected in the point of heat delivery (substation) in order to make fair distribution of costs. This kind of distribution (sub metering - as it is often referred to in literature) can be done by real physical meas-

fizičkim merenjima ili korišćenjem alokatora. Pod-merenje nije zastupljeno u velikom broju Evrospkih zemalja[8]. Kako usluga daljinskog grejanja u Srbiji već nije konkurentna sa raspoloživim alternativama i kako je njen trošak već veći od troška ove usluge u apsolutnom smislu, u većini drugih evropskih zemalja, uvođenje pod-merenja u Srbiji bi samo doprinelo uvećanju troška i dodatno unazadilo konkurentnost ove usluge. Takođe, alokacija bi pokazala da lošije zgrade u kojima najčešće žive stanovnici sa nižim primanjima imaju veće troškove grejanja što bi moglo dodatno negativno da utiče na stepen naplate i otkazivanje korištenja usluge od korisnika. Pod-merenje može da omogući identifikaciju troška, ali ne može da omogući smanjenje jediničnog troška isporučenog MWh toplotne energije. **Veličina jediničnog troška isporuke 1 MWh toplote u sistemima daljinskog grejanja u Srbiji ugrožava opstanak ove usluge na kratak rok.**

TARIFE ZA DALJINSKO GREJANJE - STRUKTURA I POREĐENJE

Tarifa za daljinsko grejanje je visoka kada se poredi sa drugim raspoloživim opcijama za grejanje prostora. Grejanje stana od 60 kvadrata koji troši prosečnih 9000 kWh za te potrebe na godišnjem nivou je skuplje od drugih raspoloživih alternativa kao što je grejanje na termoakumulacione peći, grejanje na drva, grejanje na ugalj ili grejanje na prirodni gas, ako se u obzir uzmu tarife daljinskog grejanja koje su bile na snazi u Beogradu ili Novom Sadu u Januaru 2013. godine.

Daljinsko grejanje ima smisla, odnosno infrastrukturu potrebnu za obavljanje delatnosti daljinskog grejanja je moguće komercijalno koristiti, samo ako je grejanje efikasno a toplotni izvor koristi neki vid reciklirane toplote ili gorivo čiji je oportunitetni trošak zanemarljiv. Važi pojednostavljeno pravilo po kome je moguće održavati infrastrukturu daljinskog grejanja ukoliko je trošak usluge manji od troška grejanja prostora pomoću toplotne pumpe. Kako je u Srbiji rasprostanjenost ove vrste grejanja trenutno mala, a cene nekih vidova energije i energenata pod kontrolom nije lako ustanoviti objektivni lokalni reper za konkurentnost usluge grejanja.



Grafikon 6. Poređenje cena različitih vidova grejanja prostora. Izvor: Agencija za energetiku Republike Srbije, sopstveni proračun[9]

[8] Final Report: Good practice in metering and billing. Prepared in 2010 and 2011 by the Task Force" Best practice in metering and billing"- Euroheat and Power

[9] Trošak grejanja na ogrevno drvo uzet iz nižeg dela opsega cena za ovaj vid grejanja.

urements or by using the allocators. Sub metering is not represented in many European countries[8]. As district heating service in Serbia is not already competitive with its available alternatives and as its cost is higher than the cost of this service in other European countries, the introduction of sub metering in Serbia would cause the increase of costs and backward competitiveness of this service. The allocation would show the fact that buildings with lower energy efficiency, where mostly live the citizens with lower incomes, have higher heating costs which would have a negative impact on payment and cancellation of service by the consumers. **Sub metering can enable the insight of costs, but cannot enable the decrease of unit cost of delivered MWh of thermal energy. The size of this unit cost of delivered 1MWh of heat in district heating systems in Serbia threatens the survival of this service in the short term.**

THE DISTRICT HEATING TARIFFS - STRUCTURE AND COMPARISON

The district heating tariffs are very high in comparison to other available options for space heating. The heating of the 60 m2 flat which spends annually the average of 9000 kWh is more expensive than the other available alternatives, e.g. storage heater, heating on wood, heating on coal, or heating on natural gas, considering the district heating tariffs in Belgrade or Novi Sad in January, 2013.

District heating makes sense, i.e. the commercial use of the infrastructure which is needed for district heating performing is possible, only if the heating is efficient and the heating source uses any recycled heat or fuel which cost is negligible. According to simplified rule it is possible to maintain the infrastructure of district heating if the service cost is lower than the cost of the space heating by heat pump. As the spread of this kind of heating in Serbia is too little and the prices of the energy are controlled, it is not easy to establish the objective local benchmark for competitive heating service.

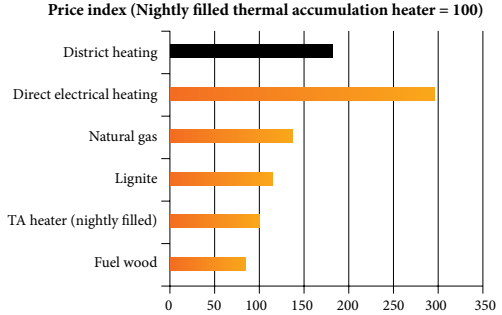
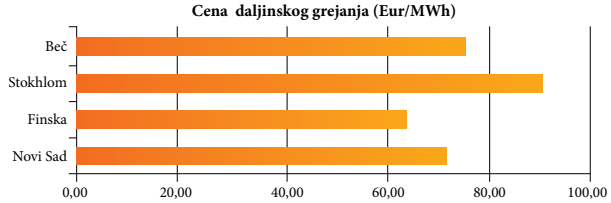


Figure 6. Index of prices for various space heating options in Serbia[9]. Source: Energy Agency of the Republic of Serbia. Own calculations.

[8] Final Report: Good practice in metering and billing. Prepared in 2010 and 2011 by the Task Force" Best practice in metering and billing" - Euroheat and Power

[9] Fuel wood heating price from the lower range of fuel wood prices.

Cena 1MWh isporučene toplotne energije je u nominalnom iznosu u nivou cene u većini evrospkih zemalja. Prosečna cena isporučenog MWh toplote u Finskoj u 2011. godini uključujući sve poreze i takse i fiksne troškove iznosila je manje od 70 eura(uključujući PDV od 23%), dok se u Švedskoj raspon cena kretao između 50 i 110 Eura za 1 MWh. Domaćinstvo čiji je stan priključen na sistem daljinskog grejanja u Beogradu ili Novom Sadu sa prosečnom potrošnjom od 150 kWh/m2 za jednu grejnu sezonu plaćiće preko 70 Eura (uključujući PDV od 8%) svaki isporučeni MWh toplote bez obzira da li se obračun za plaćanje vrši po kvadratnom metru ili po isporučenom kWh toplotne energije[10].



Grafikon 7. Cene dlajinskog grejanja na izabranim lokacijama

U Švedskoj i Finskoj uglavnom ne postoji regulacija cena daljinskog grejanja, i porez na dodatu vrednost je veći od 20%. Preduzeća iz ove oblasti posluju sa profitom, nisu korisnici državnih subvencija i imaju kontrolisane negativne učinke na životnu sredinu.

Tabela 4. Cene daljinskog grejanja bez poreza na dodatu vrednost po isporučenoj toploti u dinarima po KWh u izabranim gradovima Srbije u mestima gde ima merenja (bez fiksnih troškova) 21.01.2013. Izvor: Udruženje toplana

Grad	Stambeni prostori	Povlašćeni prostori	Poslovni prostori
Beograd	5.77	-	7.26
Novi Sad	5.40	-	5.40
Kragujevac	4.153	6.23	6.23
Bor	5.50	8.25	8.25
Subotica	4.28	5.99	7.28
Pančevo	5.90	-	5.90

Račun za daljinsko grejanje predstavlja značajan deo raspoloživog dohotka domaćinstava koja koriste ovu uslugu u Srbiji. Ipak, poslovni prihodi sistema daljinskog grejanja nisu dovoljni da pokriju troškove. Prosečan račun domaćinstva u Novom Sadu koje troši 9,000 kWh za jednu grejnu sezonu sa 6kW instalisane snage iznosi na godišnjem nivou oko 15% iznosa bruto domaćeg proizvoda po glavi stanovnika u Srbiji. Ovaj iznos prevazilazi 10% ukupno raspoloživog dohotka prosečnog vojvođanskog domaćinstva.

[10] Oba preduzeća duguju snabdevaču prirodnim gasom nekoliko desetina miliona evra. Tačni podaci nisu dostupni.

The price of 1MWh of delivered thermal energy is in nominal terms in the level of the costs of most European countries. The average price of delivered 1MWh heat in Finland in 2011 including all taxes and fixed costs was less than €70 (including 23% VAT), while in Sweden the price bracket was between €50 and €110 for 1MWh. Household which flat is connected to district heating system in Belgrade or Novi Sad[10] with average consumption of 150 kWh/m2 in one heating season will pay more than €70 (including 8% VAT) every 1MWh delivered no matter whether the payment is per square meter or per 1kWh of delivered thermal energy.

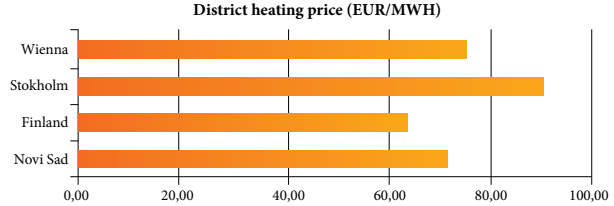


Figure 7. District heating prices in selected locations

Regulation of the district heating prices in Sweden and Finland mainly does not exist, and the value added tax is more than 20%. The companies in this area are profitable, they are not the beneficiaries of government subsidies and they have controlled negative impact on environment.

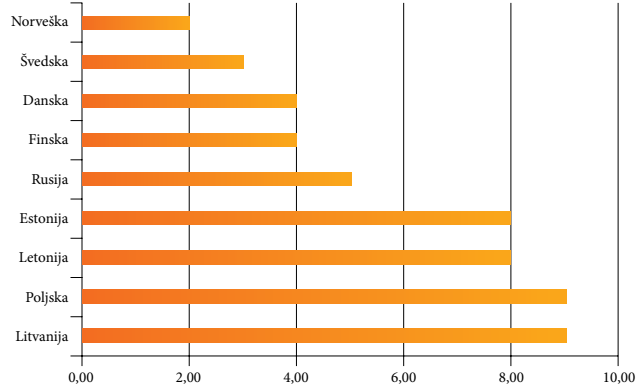
Table 4. Prices of district heating (excl. VAT) in RSD/KWh (excl. fixed costs) 21.01.2013. Source: District Heating Utility Companies' Association

City	Residential premises	Benefit-qualifying premises	Business premises
Beograd	5.77	-	7.26
Novi Sad	5.40	-	5.40
Kragujevac	4.153	6.23	6.23
Bor	5.50	8.25	8.25
Subotica	4.28	5.99	7.28
Pančevo	5.90	-	5.90

District heating bill represents significant part of available income of householdwhich uses this service in Serbia. However, the business incomes of district heating system are not enough to cover all the costs. The average bill of household in Novi Sad which spends 9000 kWh in one heating season with 6kW installed power is annually 15% GDP per capita in Serbia. This amount is higher than 10% of total available income of average household in Vojvodina.

[10] Both utilities owing tens of millions of euros to natural gas supplier. Exact data are not available.

Odnos prosečnog godišnjeg računa za grejanje i BDP po glavi stanovnika (%)



Grafikon 8. Učešće prosečnog godišnjeg računa za daljinsko grejanje u BDP po glavi stanovnika u izabranim zemljama

Daljinsko grejanje je postalo delatnost kojom nije zadovoljan niko u lancu pružanja usluge: snabdevači gorivom potražuju novac od proizvođača usluge, koji potražuju novac od korisnika koji su nezadovoljni kvalitetom i cenom usluge. Lokalne samouprave posmatraju sistem daljinskog grejanja kao mogući izvor ogromnih budžetskih problema i činilac destabilizacije ukupne društvene situacije na lokalu. Vlada Republike Srbije izdvaja sredstva za nabavku goriva za robne rezerve koje pozajmljuje toplanama, trpi gubitke na svojoj imovini u gasnom sektoru, garantuje kredite za podršku sektoru daljinskog grejanja i ograničeno upravlja svojom drugom imovinom u energetskom sektoru usled povremeno nezadovoljavajućeg kvaliteta usluge daljinskog grejanja.

PRAVNI OKVIR

Proizvodnja i distribucija toplotne energije je komunalna delatnost u smislu zakona o komunalnim delatnostima. Takođe, ovaj zakon naglašava da je ova komunalna delatnost, delatnost od opšteg ekonomskog interesa u smislu propisa o zaštiti potrošača. Prema Zakonu o energetici delatnost proizvodnje toplotne energije kao i delatnost distribucije i snabdevanja toplotnom energijom su delatnosti od opšteg interesa. Cene toplotne energije odnosno izvršenih usluga su regulisane cene.

Odredbe zakona o komunalnim delatnostima i Zakona o energetici, uspostavljaju okvir u kome se obavlja delatnost proizvodnje toplotne energije kao i delatnosti distribucije i snabdevanja toplotnom energijom. Moguće je obavljati ove delatnosti u postojećem zakonskom okviru na način koji bi investitoru u unapređeni sistem daljinskog grejanja donosio profit, potrošačima kvalitet i pristupačnost uz brojne pozitivne efekte na domaću privredu i životnu sredinu. Izmene zakonskog oklvira nisu neophodan preduslov za ovu promenu.

Share of average district heating annual bill in GDP per capita (%)

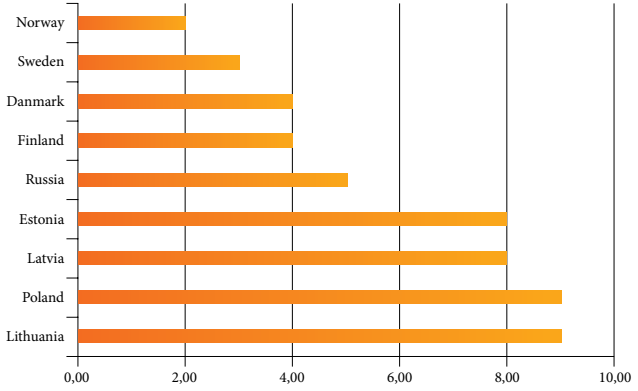


Figure 8. Shares of district heating annual bills in GDP per capita in selected countries

District heating has become a business which does not satisfy anyone in the chain of service: fuel suppliers claim money from those who provide the service who claim money from the consumers who are not satisfied with the quality and the price of the service. Local governments consider district heating system as a possible source of huge budget problems and as a thing which can cause destabilizing of the local social situation. The Serbian Government allocates funds for purchasing of fuel for commodity reserves which lends to heating plants, suffers the loss in its own gas sector, guarantees the credits for supporting of district heating sector and has limited control over its other asset in energy sector due to the occasionally dissatisfied quality of district heating service.

LEGAL FRAMEWORK

The production and distribution of thermal energy is communal activity in the sense of Law on Communal Activities. This law also points out that this communal activity is the activity of general economic interest in terms of the Consumer Protection Act. According to the Energy Law, the production of thermal energy as well as the distribution and supply of thermal energy are the activities of general interests. The prices of thermal energy i.e. performed services are regulated prices.

The provisions of the Act of Communal Activities and the Energy Law establish the framework in which activities of heat production delivery and supply are performed. It is possible to conduct these activities in current legal framework in the way that would be profitable for the investor in improved district heating system, simultaneously delivering the quality and accessibility of the service to the consumers and bringing many positive effects on domestic economy and environment. Modifications of the legal framework are not needed for this change.

Privremeni trgovinski sporazum sa EU! Od 1.februara 2013, Srbija više nema pravo da subsidira javna i komunalna preduzeća.

Regulaciju cene vrši lokalna samouprava, grad odnosno Grad Beograd. Regulisanjem cena se prema zakonu o energetici obezbeđuje:

1. Pokrivanje opravdanih troškova i prinosa na angažovana sredstva i investicije u obavljanju regulisane delatnosti, kojima se obezbeđuje kratkoročna i dugoročna sigurnost snabdevanja, odnosno održivi razvoj sistema
2. Podsticanje ekonomske i energetske efikasnosti
3. Nediskrimancija, odnosno jednaki položaj za snabdevače, kupce i druge korisnike sistema
4. Sprečavanje međusobnog subvencionisanja između pojedinih delatnosti koje obavljaju energetski subjekti i između pojedinih kupaca i grupa kupaca.

Dok se koriste postojeće tehnologije u sistemima daljinskog grejanja neće biti moguće postaviti regulatorni okvir u kome bi bilo izvodljivo ostvariti ciljeve regulacije navedene u Zakonu o energetici. Upotreba biomase, otpadne toplote i drugih obnovljivih izvora energije je neophodan korak ka otvaranju te mogućnosti i ka omogućavanju uvođenja „lake“ regulacije[11] ili potpunog ukidanja regulacije.

Na osnovu Privremenog trgovinskog sporazuma sa Evropskom Unijom od 1.februara 2013, Srbija više nema pravo da subsidira javna i komunalna preduzeća!

POGLED IZNUTRA

Lokalne samouprave imaju ključnu odgovornost za budućnost ove usluge u Srbiji i njen uticaj na standard građana, kvalitet života i ekonomski razvoj. Kroz projekat“ Dekarbonizacija daljinskog grejanja u Srbiji“ sprovedeno je istraživanje u 14 lokalnih samouprava u kojima postoje sistemi daljinskog grejanja. Istraživanje je pokazalo da postoji razumevanje veličine izazova sa kojim se lokalne samouprave suočavaju u ovoj oblasti da postoji vera da bi određeni tip promena mogao doprineti poboljšanju situacije.

Tabela 5. Spisak lokalnih samouprava u kojima je rađeno istraživanje

1. Jagodina
2. Kragujevac
3. Kraljevo
4. Negotin
5. Niš
6. Pirot
7. Sremska Mitrovica
8. Užice
9. Valjevo
10. Vranje
11. Vrbas
12. Zrenjanin
13. Šabac
14. Čačak

[11] Kontrola od strane tela nadležnog za kontrolu i monopola, konkurenciju na tržištu i zaštitu potrošača, bez direktne regulacije cena.

The price regulation is done by the local government, the city i.e. The City of Belgrade. According to the Energy Law, the regulation of prices provides:

1. The covering of justified costs and return on investments for conducting the activities, which provide short-term and long-term security of supply, i.e. sustainable system development
2. Encouraging economic and energy efficiency
3. Non-discrimination, i.e. equal position for suppliers, buyers and other consumers of the system
4. Prevention of cross-subsidization between some activities which are carried out by energy operators and between some buyers and group of buyers.

It is not possible to create the regulatory framework where it would be feasible to accomplish the goals of regulation which is set out in the Energy Law, while the current technologies in district heating systems are used. The use of biomass, waste heat and other renewable sources of energy is an inevitable step for openingof that opportunity and for implementation of "light" regulation[11] or total abolition of regulation.

Starting 01. February 2013 and based on the Interim Agreement on trade and trade related matters between Serbia and the EU budgetary subsidies for public and communal utilities in Serbia should cease to exist!

THE INSIDE OVERVIEW

The local governments have the key responsibility for the future of this service in Serbia and for its impact on the living standard of citizens, life quality and economic development. Through the project "Decarbonization of district heating in Serbia" a survey was conducted in 14 local governments in which district heating systems operate. The survey showed that there is the comprehension of challenge which local governments have to face with in this area and that there is belief in the fact that some changes would provide the improvement of situation.

Table 5. List of municipalities in which survey was conducted

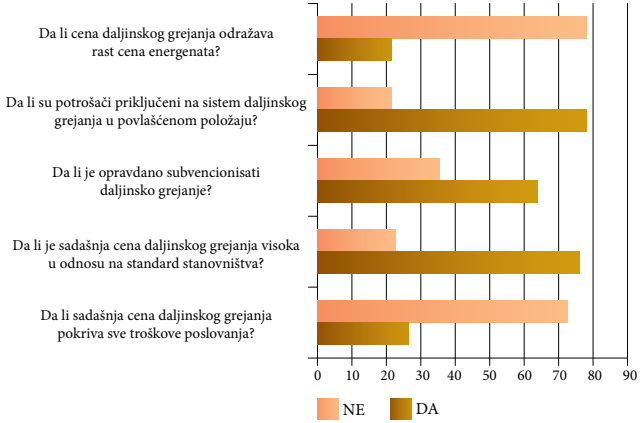
1. Jagodina
2. Kragujevac
3. Kraljevo
4. Negotin
5. Niš
6. Pirot
7. Sremska Mitrovica
8. Užice
9. Valjevo
10. Vranje
11. Vrbas
12. Zrenjanin
13. Šabac
14. Čačak

[11] Control from the body entrusted to control monopolistic behavior, competition and consumer protection without direct price regulation.

Opštine su izabrane uzimajući u obzir veličinu, geografski položaj i tip goriva koji se koristi u sistemu. Takođe, nisu uzete u obzir opštine[12] čiji su sistemi bili predmet analize u projektu „Prefeasibility assesment of district heating applications in Serbia“ koji je uz podršku USAID sprovodila International Resource Group.

Ispitanici u okviru prve teme u kojoj je ispitivan **odnos predstavnika jedinica lokalne samouprave prema mogućim promenama u sistemima daljinskog grejanja na lokalnom nivou** su bili donosioci odluka (gradonačelnici, njihovi zamennici ili pomoćnici), članovi gradskih i opštinskih veća zaduženi za energetiku[13], načelnici gradske/opštinske uprave, načelnici uprave u čijoj je nadležnosti daljinsko grejanje i energetski menadžeri ili izvršioci koji se bave pitanjima energetike.

Odgovori ispitanika na set opštih pitanja su pokazali da donosioci odluka i službenici u lokalnim samoupravama smatraju da cena daljinskog grejanja ne pokriva troškove, da ne prati rast cene energenata kao i da je visoka u odnosu na standard stanovništva. Sa druge strane većinski su na stanovištu da je opravdano (pod određenim okolnostima i na različite načine) subvencionisati daljinsko grejanje dok njih 78.85% tvrdi da su potrošači priključeni na sistem daljinskog grejanja u privilegovanom položaju.



Grafikon 9. Odgovori na set opštih pitanja vezanih za daljinsko grejanje u grupoi donosioca odluka i službenika lokalne samouprave u procentima[14].

Ispitanici većinski smatraju da tehnologija koja je primenjena u sistemima daljinskog grejanja nije ni ekonomski (58% ispitanika) ni ekološki (66% ispitanika) opravdana. Preko 60% ispitanika smatra da sistemi daljinskog grejanja u današnjem stanju nisu ni ekonomski, a ni finansijski održivi iako njih 58 % smatra da su sistemi tehnički efikasni.

[12] Majdanpek, Bor, Knjaževac, Trstenik, Zaječar, Bajina Bašta, Kosjerić, Nova Varoš, Novi Pazar i Priboj.

[13] Ili komunalne delatnosti, infratsrukturu, lii životnu sredinu.

[14] Izvor: Istraživanje obavljeno u okviru projekta " Dekarbonizacija daljinskog grejanja u Srbiji" CeSID 2012.

The municipalities were chosen according to size, geographic location and fuel that is used in a system. Additionally, the municipalities[12] which systems were analysed in the project "Prefeasibility assessment of district heating applications in Serbia" which was conducted by International Resource Group with the support of USAID, were not taken into account.

Within the first theme which examines the attitude of local authorities towards possible changes in district heating systems on local level, the respondents were decision makers (mayors, their deputies and assistants), members of municipal councils in charge of energy[13], head of municipal administration, head of administration that is in charge of district heating and energy managers or executives involved in energy issues.

The answers of the respondents on the set of general questions showed that decision makers and employees of local governments consider that the price of district heating does not cover the costs, does not follow the rising price of energy as well as that the price is too high in comparison to the standard of citizens. On the other hand, the majority justifies the subsidized district heating (under certain circumstances and in different ways) while the 78,85 % of them claims that the consumers connected to the district heating system are in privileged position.

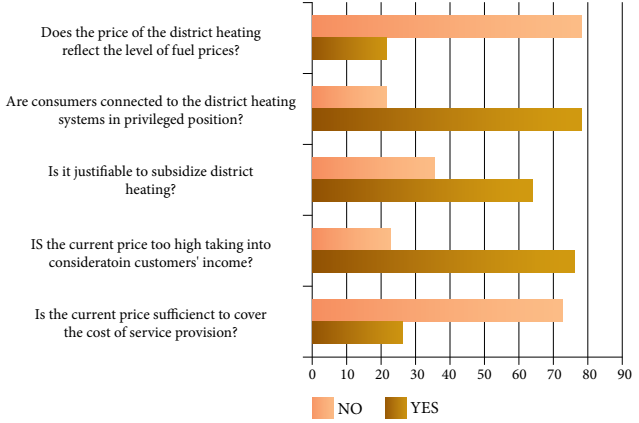


Figure 9. Response to the set of general questions related to the districty heating among the decision makers and local civil servants, in percentages[14].

The majority of respondents considers that the technology which is applied in district heating systems is not neither economically (58% of respondents) nor ecologically (66% of respondents) justified. More than 60% of respondents consider that current district heating systems are neither economically nor financially sustainable, though 58% of them consider that the systems are technically effective.

[12] Majdanpek, Bor, Knjaževac, Trstenik, Zaječar, Bajina Bašta, Kosjerić, Nova Varoš, Novi Pazar and Priboj.

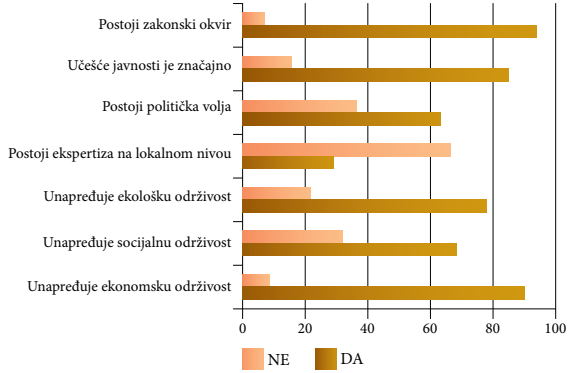
[13] Or communal activities· infrastructure or environment

[14] Source: Survey conducted within the framework of the “Decarbonization of the district heating systems in Serbia” project

59.62 % ispitanika veruje da bi tehnička promena (zamena tipa goriva) imala najveći uticaj na unapređenje sistema daljinskog grejanja. To do sada nije uradjena ni u jednom sistemu daljinskog grejanja u celini.

Ispitanici su se pozitivno izražavali o mogućem dejstvu organizacionih i tehnoloških promena, kao i restrukturirana i korištenja modela javno-privatnog partnerstva na ekonomsku, socijalnu i ekološku održivost sistema daljinskog grejanja.

Neka vrsta javno-privatnog partnerstva je nepohodan preduslov za zelene investicije u sisteme daljinskog grejanja u Srbiji. Ispitanici čvrsto veruju u pozitivan efekat takve promene, tvrde da postoji politička volja da se ta promena dogodi i razumeju važnost učešća javnosti u tom procesu. Oni takođe razumeju da je potrbena podrška za primenu ovog modela budući da je znanje na lokalnom nivou nedovoljno.



Grafikon 10. Stavovi ispitanika u vezi sa pojedinim aspektima javno-privatnog partnerstva u oblasti daljinskog grejanja

U okviru istraživanja rada i funkcionalnosti toplana ispitivani su rukovodioci i glavni inžinjeri u toplanama. Svi ispitanici su negirali mogućnost finansiranja novih kotlovskih kapaciteta iz sopstvenih sredstava, a 84% tvrdi da nisu u mogućnosti da finansiraju ni rekonstrukciju mreže i podstanica iz sopstvenih sredstava.

59.62% of respondents believe in the fact that technical change would have the greatest impact on improvement of district heating systems.
Respondentspositively state their opinion about possible effects of organizational and technological changes, restructuring and deployment of public-private partnerships (PPP) on economic, social and environmental sustainability.

A public-private partnership is necessary precondition for green investment in district heating systems in Serbia. Respondents strongly believe in positive effect of these changes, claim that there is a political will to carry out the changes and apprehend the significance of public participation in that process. Besides, they understand that there is a need for supporting the implementation of this model as the local knowledge is not enough.

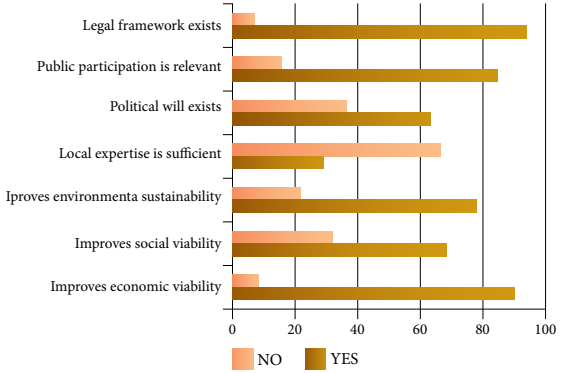


Figure 10. Respondents' attitudes and opinions towards certain aspects of PPP in district heating

Within the research of work and functioning of the heating plants, managers and chief engineers in heating plants were tested. All the respondents denied the possibility of financing the new boiler capacities from the own funds, while 84% of them claims that there is not a possibility of financing the renovation of network and substations from the own funds.

RASPOLOŽIVOST RESURSA

Podaci Nacionalne Inventure šuma Srbije koja je izvršena u periodu 2006-2009 godine pokazuju da šume u Srbiji (bez Kosova) obuhvataju 2.252.400 ha ili 29.1% od ukupne površine Republike. Prema inventuri ostala šumska zemljišta, kao i neplodna zemljišta pokrivaju 474.400 ha (6.1%), tako da prema sadašnjem stanju oko 35% zemljišta ima isključivo neku od namena koja je vezana šumu i šumarstvo.

Stanje šuma karakteriše izuzetno visok stepen šuma izdanačkog porekla, ukupno 1,45 mil ha što čini čak 64.7% ukupnih šuma. Ove šume imaju nisku prosečnu zapreminu (124.4m3/ha) i prirast (3.1 m3/ha) tako da su njihovi proizvodni, ekološki, estetski i drugi potencijali manji očekivanih. Razređenih sastojina ima oko 27%, dok u potpunosti devastirane obuhvataju 2,5% šuma.

Ohrabrujuća je činjenica da je registrovano 174.800 ha (7.8%) veštački podignutih šuma, koje su rezultat intenzivnih radova na pošumljavanju od početka druge polovine XX veka. Takođe 70,6% čine očuvane visoke i izdanačke sastojine koje predstavljaju izuzetno značajan prirodni potencijal koji je u sadašnjim uslovima ispod optimalnog.

Vlasnička struktura šuma je neznatno u prednosti u korist državnih šuma (1,19:16mil ha). Međutim, stanje privatnih šuma je daleko nepovoljnije i njihova namena je uglavnom proizvodnja drveta za ogrev za potrebe vlasnika i manjim delom za tržište. Posebno je nepovoljna činjenica da privatne šume karakteriše izuzetno niska prosečna površina parcele od svega 0,3ha, kao i da ukupan broj privatnih vlasnika iznosi oko ½ miliona.

Da bi se utvrdila isplativost korištenja drvne boimase u jeftinom obliku kao što je drvna sečka, za potrebe daljinskog grejanja potrebne su lokalizovane analize. Metodologija koja se sada već standardizovano primenjuje u Srbiji podrazumeva kozervativnu procenu resursa kojom se bilansira:

- Drvni ostatak od seče
- Resurs koji može biti preusmeren ka sistemima daljinskog grejanja putem unapređenja efikasnosti korišćenja ogrevnog drveta u domaćinstvima[15]
- Resurs koji se može dobiti rekonstrukcijom degradiranih šuma
- Resurs iz pošumljavanja i melioracije
- Resurs iz plantaža kratke ophodnje

Grafikon 11. Principi bilansiranja drvne biomase za korišćenje i gajenje u energetske svrhe

[15] Koja prelazi 12 TWh godišnje u uređajima izrazito niske efikasnosti.

RESOURCE AVAILABILITY

According to NFI Republic of Serbia, 2006-2009, of the total area of its territory 2.252.400 ha or 29.1% is covered by forests (without Kosovo). Additionally, the other forest areas as well as barren land cover 474.400 ha (6.1%), so currently about 35% of land has the purpose related to forest and forestry.

The forest condition is characterized by large share of self-grown forests, a total of 1.45 mil ha which is 64.7% of total forests. These forests have a low average volume (124.4 m3/ha) and a growth (3.1 m3/ha) so their productive, ecological, aesthetic and other potentials are lower than it is expected. 27% is attenuated, while 2.5% of forests are totally devastated.

The encouraging fact is that it is registered 174.800 ha (7.8%) of artificially afforestation, which is the result of intensive afforestation from the second part of XX century. Besides, 70.6% is preserved high stands which represent very significant natural potential that is currently under optimal conditions.

The ownership structure of forests is in slight advantage in favour of the state forests (1.19:16 mil ha). However, the state of private forests is much worse and their purpose is mainly the production of firewood for the owner and a smaller part for the market. There is an unfavourable fact that private forests are characterized by very low average parcel area of 0.3 ha, as well as the total amount of private owners is about ½ million.

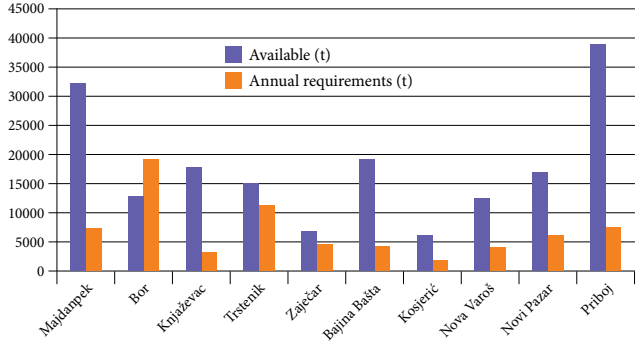
The localized analyzes are necessary for district heating in order to determine the profitability of wood biomass in cheap form such as wood chips. The methodology which is current standard in Serbia means conservative estimate of resources accounting for:

- Wood harvest residues
- Resource which can be diverted to the district heating systems in the way of improved efficiency of the use of firewood in households[15]
- Resource which can be obtained by reconstruction of degraded forests
- Resource from the afforestation and land amelioration
- Resource from the short-rotation energy plants

Figure 11. Principles for wood biomass availability estimation for energy purposes

[15] Accounting for more than 12 TWh thermal annually in low efficient devices.

Lokalizovane studije raspoloživosti biomase dale su ohrabrujuće podatke za još 10 gradova i opština u Srbiji kada se uzme u obzir potrošnja energenata u sistemima daljinskog grejanja koji postoje u tim lokalnim samoupravama.



Grafikon 12. Godišnje potrebe (narandžasti stub) i raspoloživa biomasa (plavi stub) za moguće korištenje u pojedinim sistemima daljinskog grejanja u Srbiji[16]

Primer prikaza podataka po pojedinim tokovima resursa koji je dobijen kao rezultat lokalizovanog istraživanja za opštinu Pirot dat je u sledećoj tabeli.

[16] Izvor: „Prefeasibility assesment of district heating applications in Serbia"

The localized studies of biomass availability gave encouraged data for 10 towns and municipalities in Serbia if we take into account the consumption of energy in district heating systems which exists in those local governments.

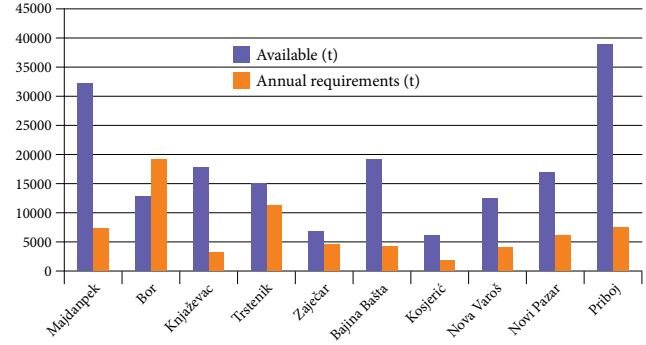


Figure 12. Wood biomass availability in selected municipalities in Serbia[16]

An example of data according to some resources which was obtained as a result of a research for the municipality of Pirot is given in the following table.

[16] Source: „Prefeasibility assessment of district heating applications in Serbia"

Tabela 6. Moguća godišnja proizvodnja šumske drvne biomase za snabdevanje sistema grejanja za grad Pirot[17]

	Izvor	Ukupna biomasa[18]	Raspoložive količine biomase	
			U periodu od prve do desete godine	U periodu od 10. do 20. godine
1	2	3	4	5
1	Ogrevno drvo (m3). Raspoložive količine (4,5) predstavljaju uštede na potrošnji ogrevnog drveta	160.000	0	15.000
2	Drvni ostatak od seče (m3)	26.000	20.000	22.000
3	Rekonstrukcija degradiranih šuma (m3)	41.500	41.500	41.500
4	Pošumljavanja i melioracije(m3) (iz mera nege, seča izbojaka, čišćenje, osvetljavanje, prve prorede)	0	0	8.750 (1.750ha*5m3)
5	Plantaže sa kratkom ophodnjom (m3) (redovni prinos)	0	0	16.000 (1.100ha * 14 m3)
	Ukupno m3	**227.500**	**61,500**	**103.250**
	Ukupno MWh[19]	**525.753**	**142.127**	**238.611**
	Ukupno toe	**45.222**	**12.225**	**20.524**

Ovako bilansirana količina više puta prevazilazi količine energenata koje se godišnje potroše u sistemu daljinskog grejanja grada Pirota.

[17] Izvor: Potencijali za proizvodnju šumske bimase za potrebe grada Pirota. Studija rađena za CeSID na projektu „Dekarbonizacija sistema daljinskog grejanja u Srbiji".

[18] Količine biomase bez tehničkog drveta, kao i drveta u šumi do 7 cm debljine, bez podzemnog dela, tankih grana i sl.

[19] Na bazi energetske vrednosti za lišćarske vrste sa procentom vlage od 35%, koeficijent za konverziju 2,311kWh/m3 drveta

Table 6. Possible available annual qunatities of forest wood biomass for supply of the district hetaing system of the city of Pirot[17]

	Source	Total biomass[18]	Available biomass qunatities	
			In the first 10 years	From 10 to 20 years
1	2	3	4	5
1	Fuel wood (m3). Available quantities (4,5) represent annual savings in fuel wood consumption	160.000	0	15.000
2	Wood harvest residues (m3)	26.000	20.000	22.000
3	Reconstruction of degraded forests (m3)	41.500	41.500	41.500
4	Afforestation and melioration(m3)	0	0	8.750 (1.750ha*5m3)
5	Short-rotation energy plants (m3) (regular annual increments)	0	0	16.000 (1.100ha * 14 m3)
	Total m3	**227.500**	**61,500**	**103.250**
	Total MWh[19]	**525.753**	**142.127**	**238.611**
	Total toe	**45.222**	**12.225**	**20.524**

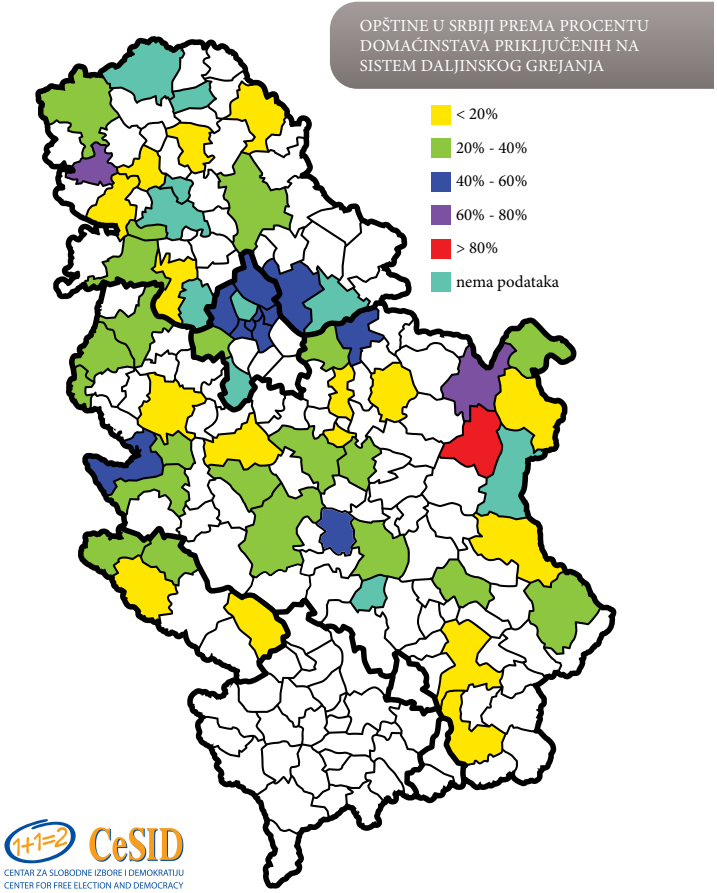
This quantity is several times greater than the quantity of energy which is annually spent in district heating system of the town of Pirot.

[17] Source: „Potencijali za proizvodnju šumske bimase za potrebe grada Pirota" Study prepared for CeSID within the framework of the „Decarbonizing district heating in Serbia" project.

[18] Not including technical wood, forest trees with diameter smaller than 7 cm, without underground parts, thin branches etc.

[19] Based on the calorific value of deciduous species with 35% humidity. Conversion ratio used: 2,311kWh/m3 wood.

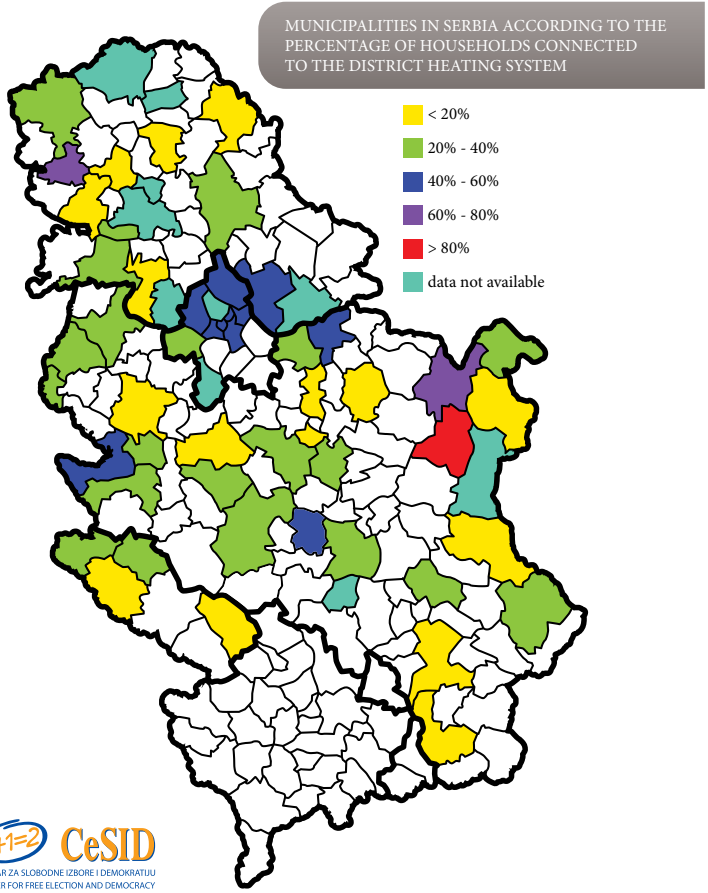
DODATAK 1: MAPE SISTEMA DALJINSKOG GREJANJA[20]



CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

[20] Prema podacima Udruženja toplana Srbije, 2010.

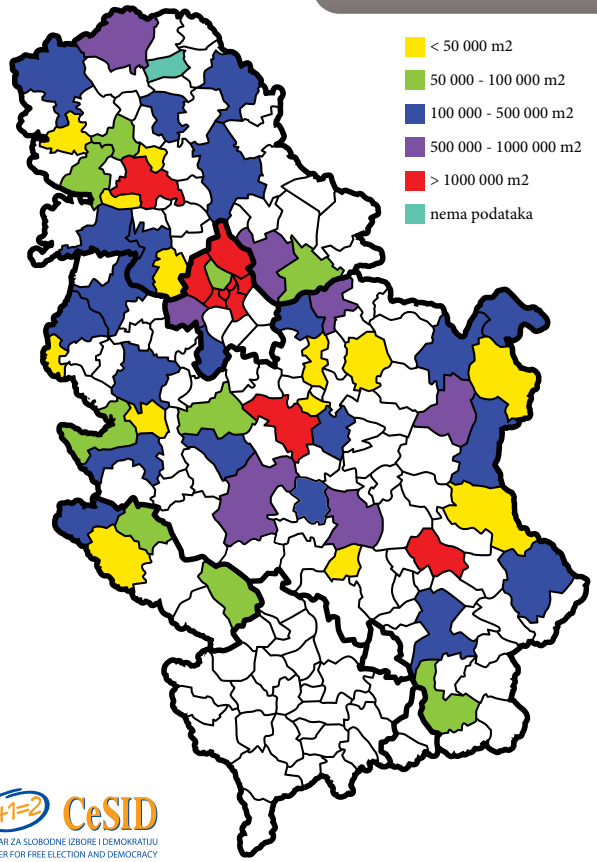
ANNEX I: MAPS OF DISTRICT HEATING SYSTEMS[20]



CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

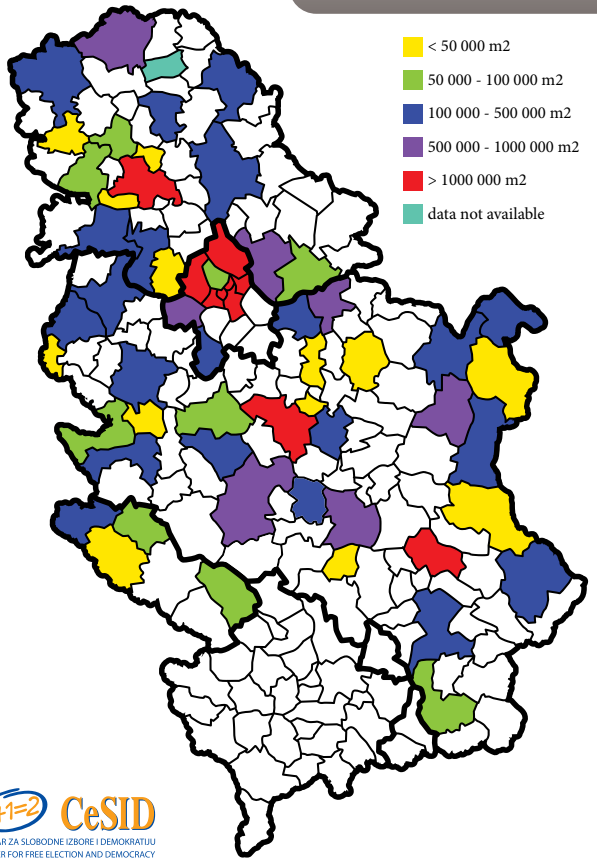
[20] Based on the data of District Heating Systems' Association 2010

TOPLANE U SRBIJI PREMA UKUPNOJ GREJANOJ POVRŠINI U M2



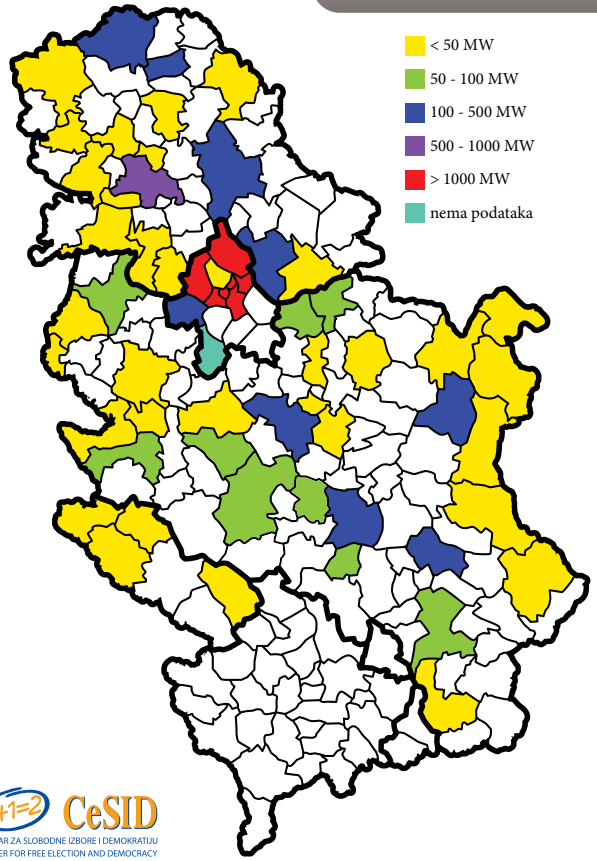
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

HEATING PLANTS IN SERBIA ACCORDING TO THE HEATED SURFACE IN M2



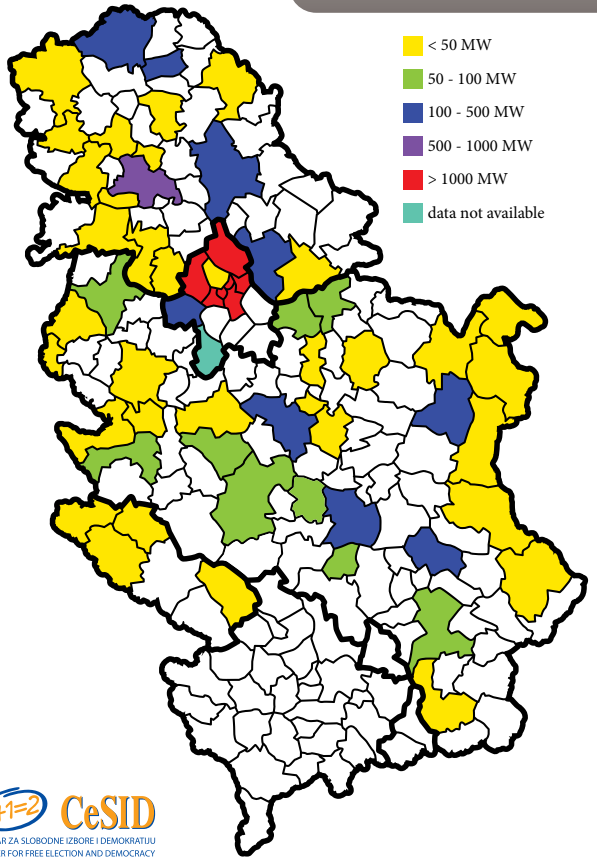
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

TOPLANE U SRBIJI PREMA UKUPNOJ INSTALISANOJ SNAZI KONZUMA (MW)



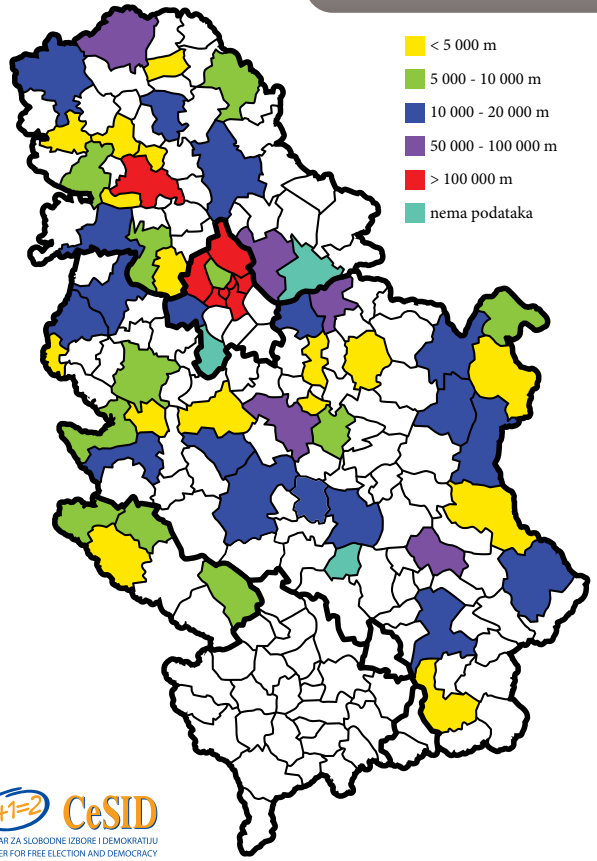
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

HEATING PLANTS IN SERBIA ACCORDING TO THE INSTALLED CAPACITY (MW)



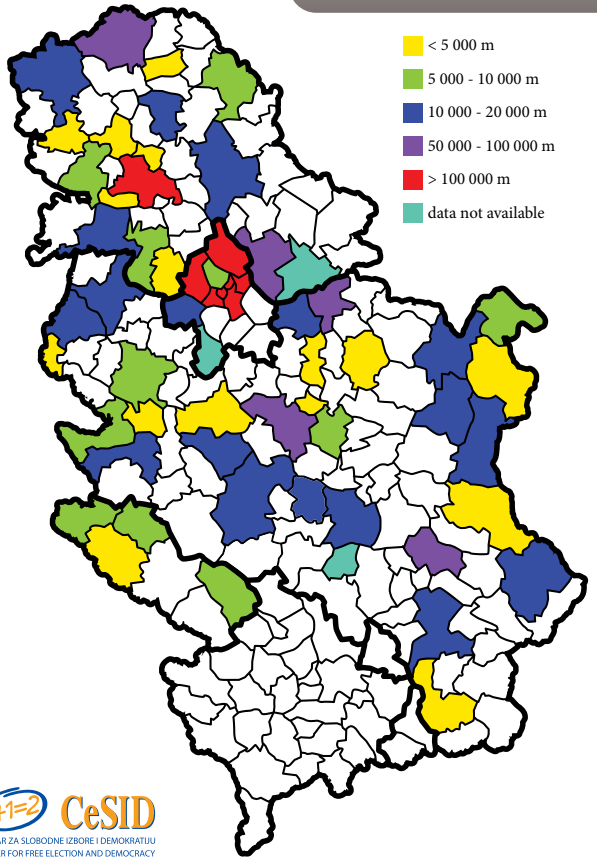
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

TOPLANE U SRBIJI PREMA UKUPNOJ DUŽINI RAZVODNE MREŽE



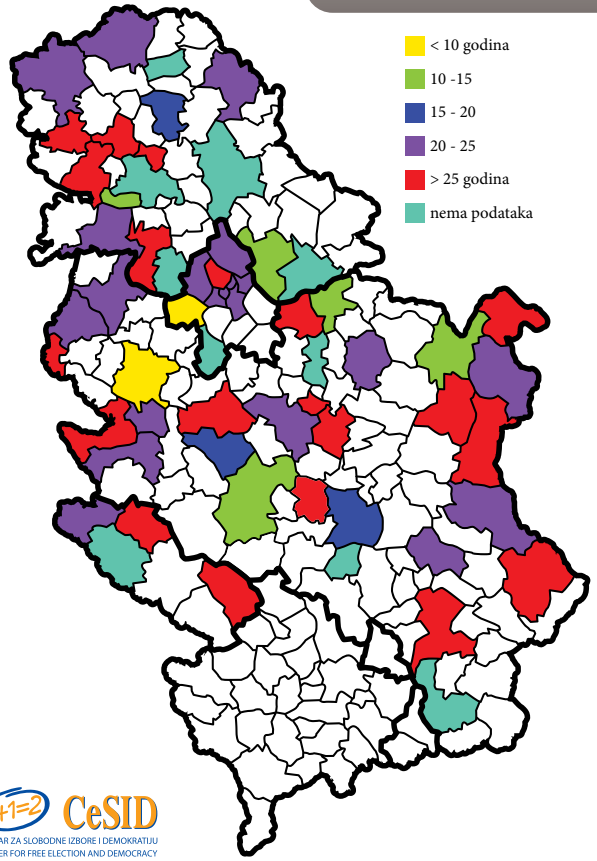
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

HEATING PLANTS IN SERBIA ACCORDING TO THE TOTAL LENGHT OF THE NETWORK



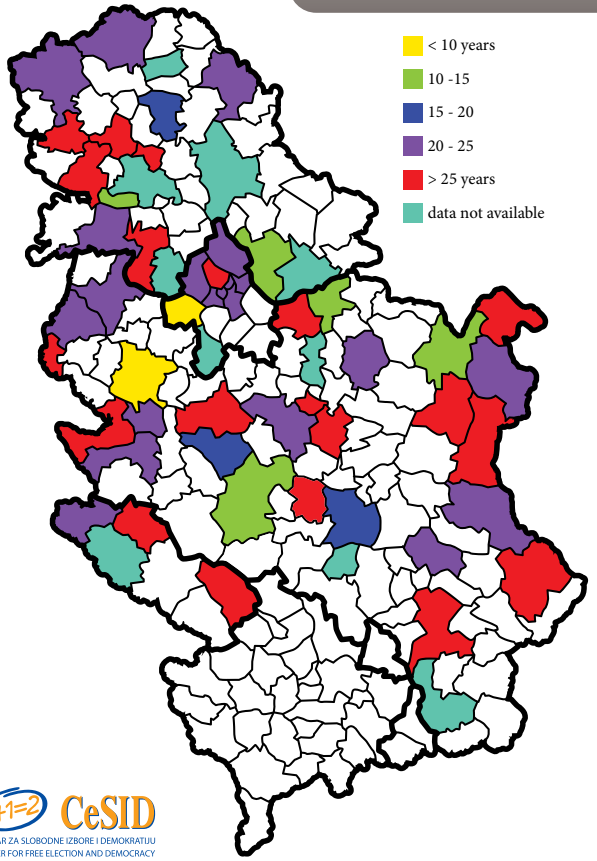
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

TOPLANE U SRBIJI PREMA PROSEČNOJ STAROSTI RAZVODNE MREŽE



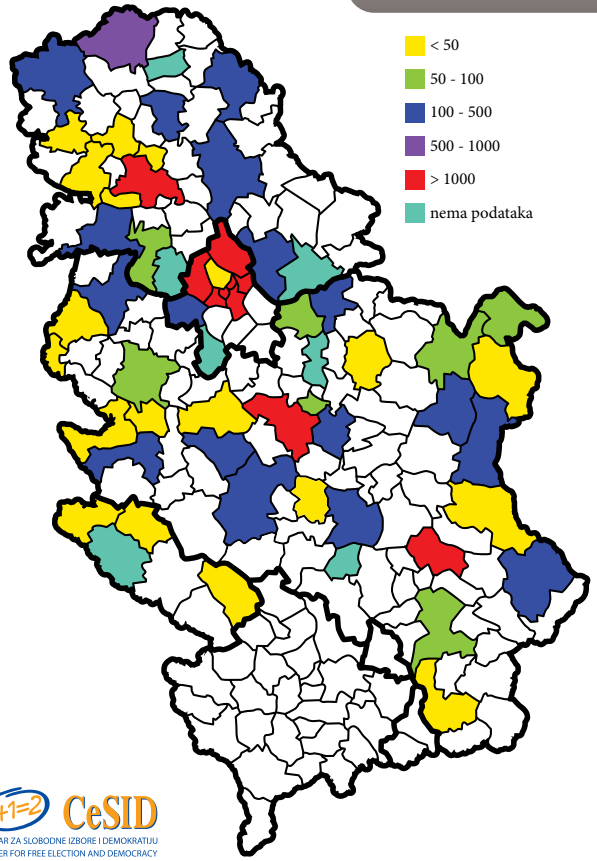
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

HEATING PLANTS IN SERBIA ACCORDING TO THE AVERAGE AGE OF THE NETWORK



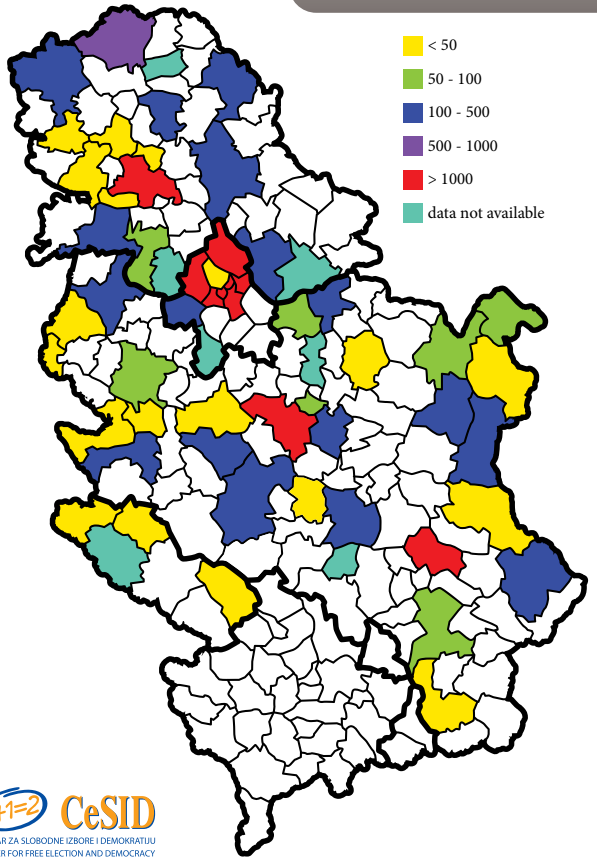
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

TOPLANE U SRBIJI PREMA UKUPNOM BROJU PODSTANICA



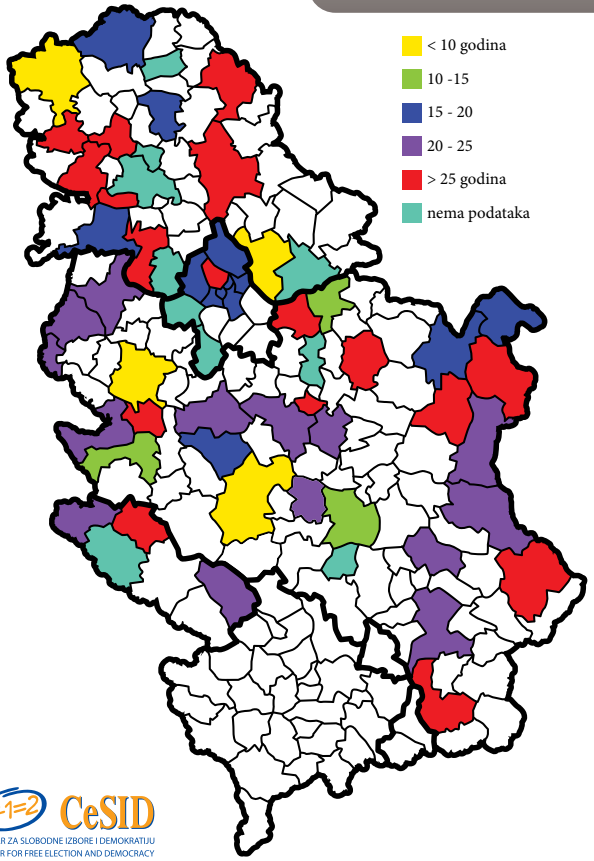
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

HEATING PLANTS IN SERBIA ACCORDING TO THE NUMBER OF SUBSTATION



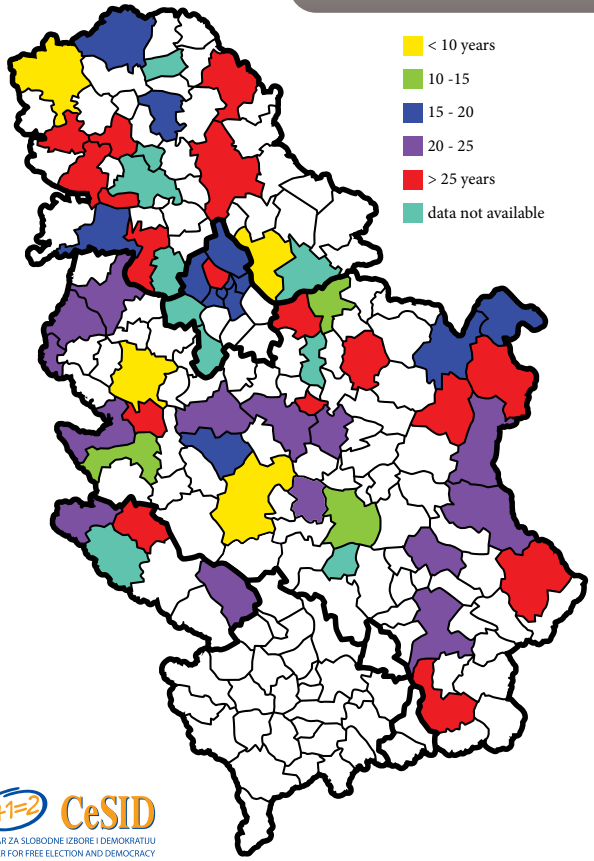
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

TOPLANE U SRBIJI PREMA PROSEČNOJ STAROSTI TOPLOTNIH PODSTANICA U SISTEMU



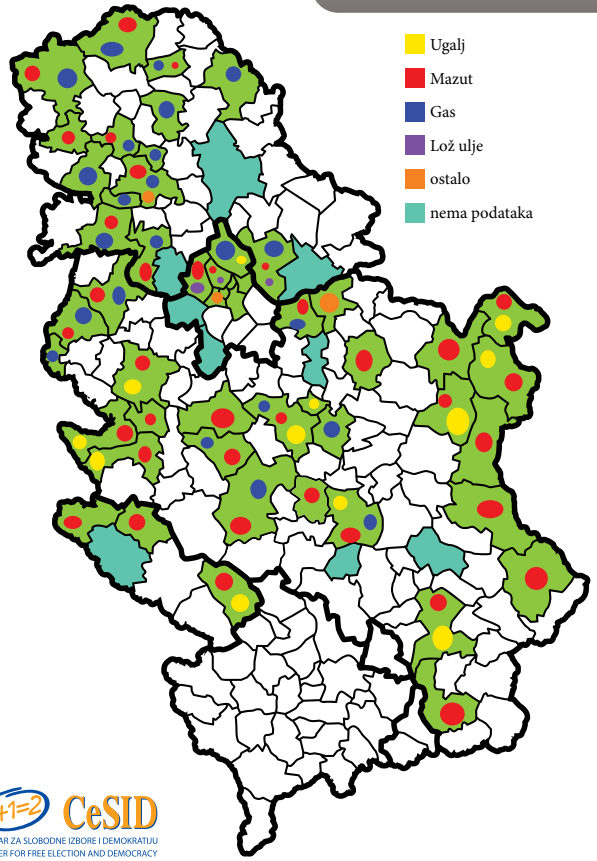
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

HEATING PLANTS IN SERBIA ACCORDING TO THE AVERAGE AGE OF THE HEATING SUBSTATIONS IN THE SYSTEM



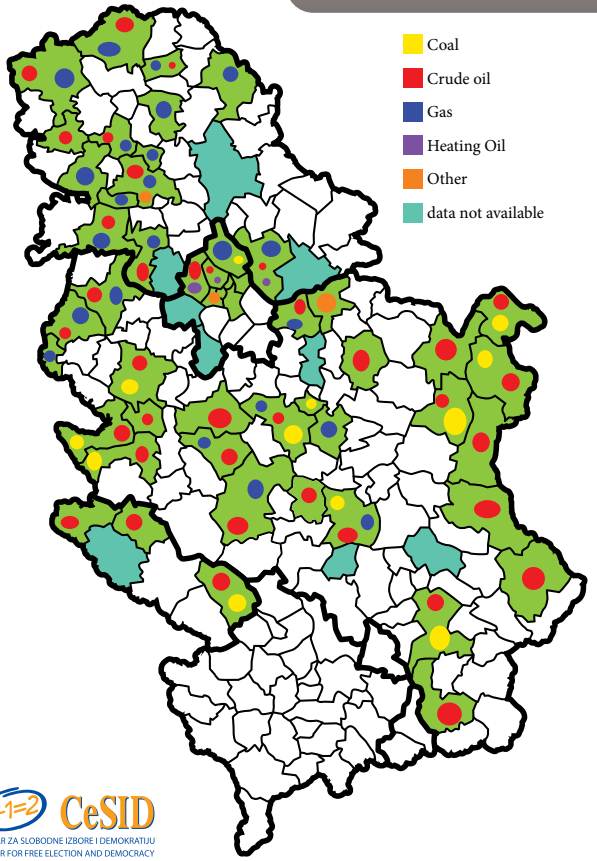
CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

TOPLANE U SRBIJI PREMA TIPU GORIVA



CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

HEATING PLANTS IN SERBIA ACCORDING TO THE TYPE OF FUEL USED



CeSID
CENTAR ZA SLOBODNE IZBORE I DEMOKRATIJU
CENTER FOR FREE ELECTION AND DEMOCRACY

Disclaimer: This publicition has been produced with the assistance of the Embassy of Finland in Belgrade. The contents of this publication are the sole responsibility of CeSID, and can in no way be taken to reflect the views of the Embassy of Finland.

Obaveštenje: Stvaranje ove publikacije pomogla je Ambasada Finske u Beogradu. Sadržaj publikacije je isključivo odgovornost CeSID-a i ne predstavlja stavove Ambasade Finske u Beogradu.