KOMPARACIJA SISTEMA DALJINSKOG GRIJANJA GRADOVA ZEMALJA U TRANZICIJI

COMPARATIVE OF THE DISTRICT HEATING SYSTEM OF COUNTRIES IN TRANSITION

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REZIME

Tokom druge polovine prošlog vijeka u Evropi su intenzivno građeni sistemi daljinskog grijanja (SDG) za snabdijevanje gradova i naselja toplotnom energijom. Uzmajući uobzir da su cijene energije u to vrijeme bile niske postojalo je ekonomsko opravdanje za izgradnju skupih infrastrukturnih distributivnih sistema. Posle prvog naftnog šoka sedamdesetih godina prošlog vijeka, došlo je do preispitivanja u potrošnji naftnih derivata (uglavnom mazuta) kao goriva u toplotnim izvorima SDG. Evropska unija ali i BiH u sektoru toplotne energije ima dugoročne ciljeve koji su usmjereni prema povećanju SDG na 30% do 2030., odnosno 50% do 2050 godine u onosu na sadašnji udio SDG od 12%. U radu se prezentuje dostupno (trenutno) stanje sistema daljinskog grijanja u BiH (Republici Srpskoj i FBiH). Rad obuhvata tehničko-tehnološke, snabdjevačke, distributivne, ekološke, ekonomske i tržišne parametre SDG gradova u BiH. Institucionalni i zakonodavni okvir prezentovan je u prethodnom radu. Komparacija parametara izvršena je u odnosu na gradove drugih zemalja u tranziciji. Glavni zaključci su da je u gradovima BiH (i u RS i u FBiH) mala iskorišćenost sistema daljinskog grijanja, u upotrebi su zastarjele tehnologije a ulaganja u nove traže značajna investiciona sredstva, postoje mali pomaci u primjeni i uvođenju obnovljivih izvora energije poput biomase, te s tim u vezi je i mali uticaj na smanjenja emisija CO_2, identifikovani su veliki gubici pri distribuciji toplotne energije, te tržišna situaciju koja s odlikuje još uvijek visokim cijenama energenata i potrošnja toplotne energije koja se još uvijek mjeri po površini prostora.

Conference paper

SUMMARY

During the second half of the last century in Europe, district heating systems (DHS) have been built intensively to supply cities and settlements with heat energy.

Taking into account that energy prices at that time were low, there was an economic justification for the construction of expensive infrastructural distribution systems. After the first oil shock of the seventies of the last century, there was a review of the consumption of petroleum products (mainly oil) as fuel in the heat sources of the DHS.

The European Union, as well as Bosnia and Herzegovina, in the heat energy sector has long-term goals that are aimed at increasing the DHS to 30% by 2030, or 50% by 2050, in that of the current DHS of 12%. The present (current) state of the district heating system in Bosnia and Herzegovina (Republic of Srpska and Federation BiH) is presented. The paper covers the technical, technological, supply, distribution, environmental, economic and market parameters of DHS in BiH. The institutional and legislative framework is presented in the previous paper, the comparison of parameters was made in relation to the cities of other countries in transition. The main conclusions are that in the cities of BiH (in the RS and FBiH) the small utilization of the district heating system is outdated, Investing in new ones requires significant investment funds, there are small movements in the application and introduction of renewable energy sources such as biomass, and in this connection, there is a small impact on CO_2

emission reductions, large losses in heat distribution have been identified, and a market situation that is distinguished still high energy prices and pricing of heat service dominantlly is based on the surface of the space.

1. UVOD

Nakon promjene političkog i privrednog sistema 1989./90. tranzicione države srednje i Istočne Europe usmjerile su se prema ulasku u Evropsku Uniju što je između ostalog podrazumijevalo i tranziciju energetskog sektora. Te zemlje su ČeškaRepublika, Estonija, Mađarska, Poljska, Slovenija, Bugarska, Letonija, Litva, Rumunija, Slovačka i Albanija. Zemlje koje su nastale raspadom bivše SFRJ, takođe pripadaju ovoj grupi, ali su u tranziciju ušle kasnije, zbog ratnih dešavanja.Tranzicija energetskog sektora je složen proces koji zahtijeva solidnu pripremu koja obuhvata: analizu postojećeg stanjaovog sektora (teI sektoratoplifikacije koji obuhvataju I sisteme daljinskog grejanja), donošenje relevantne zakonske regulative, restrukturisanje, liberalizaciju tržišta, privatizaciju, strani kapital. U poslednjih desetak godina dvadesetog vijeka u većini tranzicionih zemalja [1] došlo je do urušavanja SDG u većini gradova, a uzroci za tu situaciju su skoro identični. Neki od njih su: postrojenja koja se na kraju svog radnog vijeka, zastarela tehnologija, neefikasna proizvodnja toplotne energije, visoka cijena energenata koji se koriste i problemi pri njigovom obezbjeđenju, energetski privredni subjekti opterećeni velikim brojem zaposlenih, neizolovane, stare, energetski neefikasne zgrade, troškovi koji premašuju prihode, značajno su utjecali na povećanje cijene grijanja, a posljedično i na smanjenje potrošnje. Kupovna moć kupaca je oslabila, što je daljinsko grijanje učinilo vrlo osjetljivim na sociološka i politička pitanja. Određen broj energetskih privrednih subjekata prestao je s pružanjem usluga isporuke toplotne energije djelomično ili potpuno.

2. MOTIVACIJA I CILJ RADA

Glavna motivacija za nastanak ovog rada nalazi se u pitanju: Kakvo je stanje sistema daljinskog grijanja u gradovima BiH (FBIH i RS), i gdje se oni nalazeu odnosu da SDG gradova u drugim zemljama u tranziciji. Cilj rada je doći do kvalitativnih podataka i odnosa između navedenih parametara uzimajući u obzir da se ovakve komparacije uglavnom daju na nivou država.

1. INTRODUCTION

After changing the political and economic system 1989/90 the transition countries of central and Eastern Europe focused on joining the European Union, which among other things also meant the transition of the energy sector. These countries are the Czech Republic, Estonia, Hungary, Poland, Slovenia, Bulgaria, Latvia, Lithuania, Romania, Slovakia and Albania. The countries that emerged from the disintegration of the former SFRJ also belong to this group, but went into transition after the war.

The energy sector transition is a complex process that requires solid preparation that includes: adoption of relevant legislation, restructuring, market liberalization, privatization, foreign capital. In the last decade of the twentieth century in most transition countries [1], DHS have collapsed in most cities, and the causes for this situation are almost identical. Some of them are: plants that are at the end of their working lives, obsolete technology, inefficient production of heat, high cost of energy used and problems with their security, energy business entities burdened with a large number of employees, uninsulated, old, energy-inefficient buildings, costs that exceed revenues have significantly influenced the increase in the cost of heating and, consequently, the reduction in consumption The purchasing power of the buyers has weakened, making district heating very sensitive to sociological and political issues. Certain number of energy companies has ceased to provide partial or complete delivery of heat supply services.

2. MOTIVATION AND OBJECTIVE OF WORK

The main motivation for the emergence of this work is: What is the state of the DHS in the cities of BiH (FBiH and RS), and where they are in relation to cities DHS in other countries in transition. The aim of the paper is to obtain qualitative data and relations between the mentioned parameters, taking into account that such comparisons are mostly given at the level of the state.

3. STANJE SISTEMA DALJINSKOG GRIJANJA U GRADOVIMA BiH

U Republici Srpskoj (RS) toplotna energija se najvećim dijelom proizvodi u toplanama, oko 94%, a ostatak u Termoelektrani Ugljevik [2].Primarni energenti koji se koriste u ovom sektoru su lož ulje i ugalj. Lož ulje je najzastupljenije, s udjelom u proizvodnji toplotne energije od 42%, ali se njegova potrošnja, od 2011. do 2015. godine smanjivala prosječnom godišnjom stopom od -10,4%. Ugalj sa udjelom od 31% je drugi energent po zastupljenosti u sektoru toplifikacije, te se u periodu od 2011. do 2015. godine zadržao istinivo proizvodnje toplotne energije iz tog energenta. Veliko povećanje proizvodnje toplotne energije iz biomase zabilježeno je u istom periodu, kao posljedica puštanja u rad nove toplane u Prijedoru, i to s prosječnom godišnjom stopom rasta od 31,2%. Prirodni gas je malo zastupljen, s udjelom od 4%, te se koristi samo u Zvorniku, a u narednom periodu iu Bijeljini [2].

Za razliku od Republike Srpske u Federaciji Bosne i Hercegovine (FBiH) se snabdijevanje toplotnom energijom vrši iz obližnjih termoelektrana, energana ili industrijskih kapaciteta. Primarni energenti u FBiH su prirodni gas (53,5%), ugalj (31,5%) i lož ulje (10,8%) [3]. Bio masa je zastupljena, s 4,2% [3]. Toplotna energija u Republici Srpskoj se uglavnom koristi u domaćinstvima, koja sačinjavaju oko 76% finalne potrošnje toplotne energije, dok je taj iznos u FBiH oko 78%. Toplotna energija u oba entiteta se isključivo isporučuje za grijanje prostora i nema snabdijevanja potrošnom toplom vodom.

U RS trenutno postoji 11 privredih društava koja se bave proizvodnjom, distribucijom i snabdijevanjem kupaca toplotnom energijom. Svi su u javnom vlasništvu i nalaze se u: Banja Luci, Doboju, Prijedoru, Gradiškoj, Palama, Istočnom Sarajevu,Brodu, Sokocu, Čelincu, Bijeljini i Zvorniku.

U FBiH privredna društva koja distribuiraju toplotnu energiju nisu njeni proizvođači a i vlasništvo je drugačije. U tabeli 1. su prikazana privredna društva koja se bave proizvodnjom, distribucijom i snabdijevanjem krajnjih kupaca toplotnom energijom.

3.1. Tehničko-tehnološki parametri

U Dodatku A, Tabela 1. prikazuje tehničko-tehnološke parametre [4,5,6].

3. THE STATE OF CITY DHS IN BOSNIA AND HERCEGOVINA

In Republica of Srpska (RS), thermal energy is mostly produced in heating plants, around 94%, and the rest in Ugljevik Thermal Power Plant. [2] Primary energy sources used in this sector are fuel oil and coal. Fuel oil is the most represented, with a 42% share in heat production, but its consumption declined from 2011 to 2015 by an average annual rate of -10.4%. Coal, with a share of 31%, is the second energy source in terms of its share in the sector, and in the period from 2011 to 2015, the true production of thermal energy from that energy source was maintained. A large increase in the production of thermal energy from biomass was recorded in the same period, as a consequence of the commissioning of a new heating plant in Prijedor, with an average annual growth rate of 31.2%. Natural gas is slightly represented, with a share of 4%, and is used only in Zvornik, and in the following period in Bijeljina [2].

Unlike the Republic of Srpska, the Federation of Bosnia and Herzegovina (FBiH) supplies heat from the nearby thermal power plants, energy or industrial capacities. Primary energy in the FBiH is natural gas (53.5%), coal (31.5%) and fuel oil (10.8%). [3]. Biomass is inactive, with 4.2% [3]. Thermal energy in the Republic of Srpska is mainly used in households, accounting for around 76% of the final consumption of heat, while this amount in FBiH is 78%.

Thermal energy in both entities is exclusively supplied for space heating and there is no supply of hot water.

In the Republic of Srpska, there are currently 11 companies that are engaged in theproduction, distribution and supply of heat energy customers. They are all publicly owned and are located in: Banja Luka, Doboj, Prijedor, Gradiška, Pale, Istočno Sarajevo, Brod, Sokolac, Čelinac, Bijeljina and Zvornik.

In FBiH, companies that distribute heat energy are not its producers and ownership is different. In the continuation of the work, technical, technological, supply, distribution, ecological, economic and market parameters of some of them are given.

3.1. Technical-technological parameters

In Appendix A, Table 1. shows technical-technological parameters [4,5,6].

Četiri generacije distribucije toplote su definisane u radu. [7]. Sa svakom novom generacijom sistema daljinskog grijanja temperatura ogrevnog medija je padala: za prvu generaciju je karakteristično da je medij bio para temperature 300ºC, u drugoj generaciji vrela voda temperature 130ºC, u trećoj generaciji topla voda temperature 80ºC, a u zadnjoj četvrtoj generaciji medij je nisko-temperaturna voda temperature 50ºC.

Promatrajući stranu proizvodnje, u prvoj generaciji kao energent koristilo se lož ulje, koje se u drugoj generaciji proširilo na gas, i kogeneracijska postrojenja na gas i ugalj, a u trećoj generaciji upotrebljavana je biomasa, industrijski viškovi i spaljivanje otpada. U četvrtoj generaciji daljinskog grijanja više se ne koriste kogeneracijska postrojenja ili samostalna postrojenja na gas i ugalj, već se za proizvodnju toplotne energije koriste kogeneracijska postrojenja za spaljivanje otpada, industrijski viškovi, kogeneracije na biomasu i biogas, viškovi električne energije iz vjetra, geotermalna i solarna postrojenja.

Glavna karakteristika četvrte generacije je da će se toplota distribuira s nižim temperaturama nego što se primjenjuje u trećoj generaciji. Distributivna mreža može distribuirati toplotu proizvedenu iz različitih energetskih izvora, od kojih se u posljednje vrijeme sve više koriste industrijski viškovi, toplota iz kogeneracija na biogoriva, geotermalna energija, solarna energija,te i viškovi električne energije (posebno OIE kao što su vjetroelektrane, koje svoju energiju odlažu skladištenjem toplotne energije kako u dnevnim tako i u sezonskim skladištima). Za postizanje razmatranih ciljeva izazov će biti uravnotežiti ponudu i potražnju za energijom, za što su vrlo pogodna skladišta toplotne energije.

3.2. Snabdijevački parametri

U dodatku A, Tabela 1. prikazani su snabdjevački parametri [3,4].

3.3. Proizvodni i distributivni parametri

U dodatku A, Tabela 1. prikazani su proizvodni I distributivni parametri [4,5,6], a dio koji se odnosi na rekonstrukciju se može naći [6].

3.4. Ekološki parametri

U skladu sa zakonodavstvom u oblasti zaštite vazduha, 2016. godine, BiH je nastavila da prati emisije zagađujućih materija u vazduhu iz termoelektrana - sumpor dioksid (SO_2), azotni oksidi (NOx), čvrste čestice i ugljen-dioksid (CO_2).

The four generations of heat distribution are defined in the paper [7]. With each new generation of the DHS, the temperature of the heating medium fell: for the first generation it is characteristic that the medium was a temperature of 300 ° C, in the second generation a hot water temperature of 130 ° C, in the third generation of hot water temperatures of 80 ° C, and in the last fourth generation the medium is low temperature water temperature 50ºC.

Observing the production side, in the first generation as a fuel, fuel oil, which in the second generation expanded to natural gas, and cogeneration plants on gas and coal, was used in the third generation, biomass, industrial surpluses and waste incineration. In the fourth generation of district heating, cogeneration plants or independent gas and coal plants are no longer used, but cogeneration plants for waste incineration, industrial surpluses, biomass and biogas cogenerations, wind surpluses from wind, geothermal and solar

The main characteristic of the fourth generation is that heat will be distributed at lower temperatures than in the third generation. The distribution network can distribute heat produced from various energy sources, of which industrial surpluses, heat from cogeneration to biofuels, geothermal energy, solar energy, and electricity surpluses (especially RES such as wind power plants, which are energy is deposited by storing heat energy in both daily and seasonal warehouses). In order to achieve these objectives, the challenge will be to balance supply and demand for energy, for which they are very suitable heat storage facilities.

3.2. Supply parameters

In Appendix A, Tabela 1.shows supply parameters [3,4].

3.3. Production and distribution parameters

In Appendix A,Table 1.shows production and distribution parameters [4,5,6], and part related to reconstruction can be found on [6].

3.4. Environmental parameters

In accordance with the legislation in the field of air protection, in 2016, BiH continued to monitor emissions of pollutants in the air from thermal power plants - sulfurdioxide (SO_2), nitrogen oxides (NOx), solid particles, and carbon dioxide (CO_2).

Emisije zagađujućih materija u vazduh i emisije CO_2 iz TE Tuzla i TE Kakanj [6,9] za 2016. su date u [6]. U Dodatku A, u Tabeli 1. prikazane su emisije CO_2 u zgradarstvu u BiH [9] .

3.5. Ekonomski parametri

U finansiranju sektora daljinskog grijanja RS i FBiH mogu se koristiti tri osnovna modela:

- Javno finansiranje, privatno finansiranje i mešano finansiranje (partnerstvo između javnog i privatnog sektora).

U modelu javne finansije dominantna je uloga javnog sektora (centralne vlade, lokalne i regionalne samouprave, javnih preduzeća, fondova i agencija). Privatno finansiranje je rasprostranjeno zbog nejednakosti između rastućih energetskih potreba i troškova izgradnje energetske infrastrukture s jedne strane i ograničenih finansijskih mogućnosti javnog sektora i javnog sektora. Partnerstvo u javnom i privatnom sektoru kao model mešovitog finansiranja za razvoj energetskog sektora sprovodi se u okviru različitih struktura vlasništva i upravljanja. Deljenje rizika, partnerstvo pruža niz pogodnosti za privatni i javni sektor.

3.6. Tržišni parametri

U Prilogu A Tabela 1., prikazuje prosječnu cijenu grijanja za domaćinstva u BiH i period u kojem se usluga plaća [6].

4. STANJE SDG U GRADOVUIMA ZEMALJA U TRANZICIJI

Ispod su navedeni parametri nekoliko gradova u Estoniji (Tallin, Haapsalu, Jõgeva, Keila, Kärdla, Rapla i Valga) i Letonija (Riga).

4.1. Estonia

U Estoniji ima 226 lokalnih jedinica, od kojih 151 koristi DHS. Godišnja potrošnja toplotne energije u Estoniji iznosi oko 4,6 TWh [7]. U Dodatku A, Tabela 1. pokazuje tehničko-tehnološke parametre, proizvodnju i distribuciju, parametre snabdevanja, emisiju CO2 u zgradarstvu i tržišne parametre [8,9,10, 12,13]. Većina postrojenja u Estoniji funkcioniše u režimu kogeneracije.

Voda proizvedena u postrojenju se prodaje mrežama daljinskog grejanja ili industrijskim potrošačima koji se nalaze blizu postrojenja. Ova tabela sadrži listu radnih postrojenja za proizvodnju kogeneracije sa sopstvenim toplotnim (MWt) i električnim kapacitetom (MWe). 60% domaćinstava koristi SDG.

Emissions of polluting substances into air and CO_2 emissions from TPP Tuzla and TPP Kakanj [6,9], for 2016 are given in [6] In Appendix A, Table 1. shows the CO_2 emissions in the building sector in BiH city [9].

3.5. Economic parameters

In the financing of the district heating sector of the RS and the FBiH, three basic models can be used:

- Public funding, Private financing and Mixed financing (partnership between the public and private sectors) In the public financing model, the public sector (central government, local and regional self-government, public companies, funds and agencies) has a dominant role.

Private funding is widespread due to the disparity between rising energy needs and the costs of building energy infrastructure on the one hand and limited financial opportunities public sector and public sector. The public and private sector partnership as a model of mixed financing for the development of the energy sector is being implemented within the various ownership and management structures. By sharing risk, the partnership provides a range of benefits to both the private and the public sector.

3.6. Market parameters

In Appendix A Table 1. shows average heating price for households in BiH and the period in which the service is paid [6]

4 THE SITUATION OF DHS IN THE CITY OF COUNTRIES IN TRANSITION

Below are some parameters of several cities in Estonia (Tallin, Haapsalu, Jõgeva, Keila, Kärdla, Rapla, and Valga) and Latvia (Riga).

4.1. Estonia

In Estonia there are 226 local units, of which 151 are using DHS. The annual consumption of heat energy in Estonia is about 4.6 TWh [7]. In Appendix A,Table A. shows shows technical-technological parameters, production and distribution, supply parameters, emission of CO2 in building sector and market parameters [8,9,10, 12,13]. Most of the plants in Estonia operate in the cogeneration regime.

The heat produced in the plant is sold to district heating networks or to industrial consumers located near the plant. The following table contains a list of operational plants for the production of cogeneration with its own thermal (MWt) and electrical capacity (MWe). 60% of households use DHS.

Postrojenje za spaljivanje otpada - elektrana Iru, od 2013. godine, moderna i efikasna jedinica za spaljivanje otpada koja proizvodi toplotu i električnu energiju iz mješovitog komunalnog otpada. Karakteristike postrojenja: Količina otpadnog otpada je 120 000 - 220 000 tona godišnje, nominalna snaga 10-18 MW, kapacitet toplote od 25-50 MWt, izlazna snaga električne energije godišnje 70-140 Gwhe, izlaz toplote 200-310 GWht godišnje. Izgradnja fabrike koštala je 1-1,5 milijardi krona.

4.2. Letonia

Letonija (Letonija) je jedan od lidera u EU za višespratne stambene zgrade koje koriste SDG. Kao rezultat, SDG je važan segment Latvijske ekonomije, sa ukupno 74 sistema daljinskog grejanja. Glavno tržište daljinskog grijanja nalazi se u devet najvećih gradova, koji pokrivajući 75% ukupnog tržišta. Letonijska prestonica Riga, sa populacijom od oko 700.000 stanovnika, čini oko pola tržišnog udjela na daljinskom grijanju. Toplotna energije proizvedena u 663 kotlovnicama i 1,32 kogeneracijska postrojenja ostvarila je 7.46 TWh. Tokom poslednje decenije, daljinsko grejanje u Letoniji je doživjelo neprekidan pomak ka obnovljivoj energiji, a dominacija prirodnog gasa smanjena upotrebom drvnog čipsa i drugih obnovljivih izvora energije (OIE). U 2015. godini udio potrošnje prirodnog gasa, naftnih derivata i uglja u kotlovima za centralno grijanje (isključujući CHP) u odnosu na 2008. je smanjen za 26,5%, 2,6% i 0,28% respektivno. U međuvremenu, udio je povećan za 28,9% [11]. U Dodatku A, u Tabeli 1. prikazani su tehničko-tehnološki parametri, proizvodni i distributivni parametri, parametri snabdevanja, emisija CO_2 u zgaradstvu i tržišni parametri [11,12]. U cilju poboljšanja energetske efikasnosti, JSC "Rīgas siltums" je primijenio niz mjera od kojih su dva od velikog značaja i kao primjeri dobre prakse preporučeni su za prenos u druge sisteme za snabdevanje toplotom i sažeti u prijedlogu "Oporavak toplote iz dimnih gasova i tokovi hlađenja u postrojenjima za proizvodnju energije", a koji su uključeni u katalog "Najbolje prakse za pametan grad" koke je pripremila opštinska agencija REA 2013. godine. Primeri dobre prakse su dati u [9].

Waste incineration plants-Iru Power Plant, since 2013, a modern and efficient waste incineration unit that produces heat and electricity from mixed municipal waste. Characteristics of the plant: The amount of waste burned is 120 000 - 220 000 tons per year,• nominal electric power 10-18 MW, Heat capacity 25-50 MWt, Output power of electricity per year 70-140 Gwhe, heat output 200-310 GWht per year. The construction of the factory cost 1-1.5 billion krona.

4.2. Letonia

Latvia (Letonia) is one of the leaders in the EU for multi-story residential buildings served by district heating. As a result, district heating is an important segment of the Latvian economy, with a total of 74 district heating systems. The main district heating market is within the nine largest cities, covering 75% of the total market. The Latvian capital Riga, with a population of nearly 700,000, accounts for approximately half of the district heating market share.The heat energy for sale produced in 663 boiler houses and132 cogeneration plants having generated 7.46 TWh. The graph below demonstrates that 30% of the residential heat demand in 2015 was supplied through district heating. During the last decade, district heating in Latvia experienced continuous shift towards renewable energy and the domination of natural gas has been diminished by wood chips and other renewable energy products. In 2015, the share of natural gas, oil products and coal consumption in the district heating boilers (excluding CHP) compared to 2008 has decreased by 26.5%, 2.6% and 0.28% respectively. In the meantime, the share of RES has increased by 28.9% [11]. In Appendix A, Table 1. shows technical-technological parameters, production and distribution, supply parameters, emission of CO2 in building sector and market parameters [11,12]. With a view to improving energy efficiency, JSC “Rīgas siltums” has implemented a number of measures in the heat sources two of which are of major importance and as best practice examples have been recommended for transfer to other heat supply systems and summarized in the proposal “Recover of heat from flue gas and cooling flows in energy production plants” included in the ecatalogue “Best practice projects for a smart city” prepared by the municipal agency REA in 2013 The examples of good practice are given in [9].

5. REZULTATI KOMPARACIJE SDG PARAMETARA

Prema Lukoseviciusu [1] u zemljama u tranziciji, naročito u onima u hladnoj klimi, velika je upotreba daljinskog grijanja i korištenja velikih kogeneracionih postrojenja. Ovo se znatno promenilo krajem dvadesetog vijeka kada je došlo do značajnog pada broja potrošača. Stare fabrike, visoke cijene energije, korisnici energije opterećeni velikim brojem zaposlenih, neizolovanih i starih zgrada, značajno su uticali na povećanje cijena grijanja i, uzročno, na smanjenje potrošnje.

Stanje SDG u BiH na osnovu poređenja parametara SDG u gradovima Estonije i Letonije može se opisati na sljedeći način: Starost i niska efikasnost proizvodnih kapaciteta, Zastarela tehnologija, Starost i veliki gubici tople vode u mreži, Teškoće u mjerenju, računanju i prikupljanju isporučene toplotne energije za pojedinačne subjekte, Visoke cijene goriva (uglja, nafte i prirodnog gasa), Korišćeni energetski proizvodi uglavnom su od uvoza, Neadekvatno naplata usluga vodi do direktnog neadekvatnog ulaganje u sektor. Dodatni problem takvih sistema je da se fokus stavlja na proizvodni i tehnički rad, a ne na potrebe potrošača [13].

Tehnička i ekonomska situacija preduzeća za proizvodnju i distribuciju toplote je teška zbog nemogućnosti “pokrivanja” troškova poslovanja, zbog primjene cijena, tj. tarifa koje ne pokrivaju sve troškove. Takvo stanje ne dozvoljava modernizaciju postojećih sistema, nedostataju podsticaji, snažan jer politički uticaj, nepredvidivi su propisi, loša ekonomska održivost i niska konkurentnost odbija privatne investitore da ulažu u sektor daljinskog grijanja, visoka potrošnja energije u zgradama sa slabom izolacijom, bez mogućnost regulisanja potrošnje toplote i niska kupovna moć većine krajnjih kupaca, što je učinilo da je daljinsko grijanje jedva dostupno, sistematično planiranje razvoja i izgradnje lokalne energetske infrastrukture je još uvijek retko, renoviranje zgrada (toplotna izolacija radi uštede energije) vrši se veoma sporo, visoki su troškovi održavanja za veće postrojenja sa malom raspodjelom količine energije u velikom mrežnom sistemu i većim gubicima u procentima u odnosu na veću količinu potencijalno isporučene energije, što dovodi do akumulacije gubitaka, male diverzifikacije izvora energije u proizvodnim pogonima, naročito mali udeo OIE,

5. RESULTS OF COMPARATION OF THE DHS PARAMETERS

According to Lukosevicius [1] in transition countries, especially in those in the cold climate, district heating and the use of large cogeneration plants are of great use. This changed significantly at the end of the twentieth century when there was a significant drop in the number of consumers. Old plants, high energy prices, energy users burdened with a large number of employees, uninsulated and old buildings, significantly influenced the increase in heating prices and, consequently, the reduction in consumption.

The state of the district heating system in BiH based on the comparison of DHS parameters in the cities of Estonia and Latvia can be described as follows: Age and low efficiency of production capacities, Outdated technology, Age and large losses in hot water and heat networks, Difficulties in measuring, calculating and collecting the delivered heat energy for individual entities, High prices of fuels (coal, oil and natural gas), The energy products used are mainly from imports,• Inadequate collection of services leads to a direct incentive to invest in the sector. An additional problem of such systems is that the focus is placed on production and technical work, not on the needs of consumers [13].

The technical and economic situation of the companies for the production and distribution of heat is difficult due to the work "below the cost of coverage", due to the application of prices, i.e. Tariffs that do not cover all costs. Such a state does not allow the modernization of existing systems, lack of incentives, strong political influence, unpredictable regulations, poor economic viability and low competitiveness refuse private investors from investing in the district heating sector, high energy consumption in buildings with poor insulation, without the ability to regulate heat consumption and low purchasing power of most end customers, which made district heating barely accessible, systematic planning for the development and construction of local energy infrastructure is still rare, the renovation of buildings (thermal insulation for the purpose of energy savings) is carried out very slowly, high maintenance costs for larger plants with a small distributed amount of energy in a large network system and greater losses in percentage over a larger amount of potentially delivered energy, leading to accumulation of losses, small diversification of energy sources in production plants, especially small share of RES, nedostatak kogeneracije na biogas, geotermalne i solarne energija, neiskorišćena upotreba preostale toplote otpadnih voda, toplota sagorevanja otpada i političkih odluka ili nove obaveze za sektor daljinskog grejanja često nisu praćene neophodnim finansijskim sredstvima.ž

6. ZAKLJUČAK

U BiH,sistemi daljinskih grijanja su pozicionirani u većim gradovima. SDG u BiH su jako različiti uzimajući u obzir različite aspekte. S aspekta vrste energenta koji se koristi, Sarajevo i Zvornik koriste prirodni gas. Razlog tome je lociranost ovih gradova uz mrežu prirodnog gasa. Banja Luka i Brod koriste mazut, koji je mnogo godina unazad bio najskuplji izvor energije za grijanje. Zatim, veliki broj sistema daljinskih grijanja koristi ugalj kao glavni energent (Doboj, Tešanj, itd.). U posljednje vrijeme izvršena je obnova postojećih sistema na biomasu (Sokolac i Pale), te prelazak nekih sistema (djelimično ili potpuno) sa mazuta na biomasu (Prijedor i Banja Luka). Posebnu grupu čine sistemi daljinskog grijanja koji koriste toplotu iz energetskih i industrijskih postrojenja (Zenica, Kakanj, Tuzla i Lukavac). Ovi sistemi daljinskog grijanja su održivi uglavnom zbog niskih cijena toplote koju primaju iz kogeneracijskih postrojenja. Najveći dio privrednih društava iz sektora daljinskog grijanja su javna preduzeća koja finansiraju lokalne zajednice u kojima se nalazi sistem daljinskog grijanja. To znači da su ova preduzeća odgovorna opštinskim i gradskim skupštinama.Problem svih SDG je predimenzionisanost (postrojenja su dimenzionisana za mnogo veći broj korisnika nego što se sada snabdijeva). Pored toga, metoda proračuna toplotnih potreba u ovim sistemima je bila bazirana na tome da sistem može adekvatno grijati objekte i pri ekstremno niskim temperaturama. Uzimajući u obzir da većina SDG uglavnom isporučuje toplotu samo za potrebe grijanja, postrojenja rade punim kapacitetom svega 20 % na nivou godine. Dodatni problem je i niska energijska efikasnost objekata. Imajući u vidu tarifni sistem (u većini sistema daljinskog grijanja plaćanje se vrši po m^2 grijanog prostora), niska energetska efikasnost objekata ima jako negativan uticaj na održivost sistema daljinskih grijanja.Mreža daljinskog grijanja kod većine sistema u BiH je u lošem stanju. Pored visokih gubitaka toplote, problem predstavljaju i gubici vrele vode zbog curenja.

lack of cogeneration on biogas, geothermal and solar energy, unused use of residual heat of waste water, heat of combustion of waste and political decisions or new obligations for the district heating sector are often not accompanied by the necessary financial.

6. CONCLUSION

In BiH, district heating systems are positioned in larger cities. DHS in BiH city are very different considering different aspects. From the aspect of the energy source used, Sarajevo and Zvornik use natural gas. The reason for this is the location of these cities along the natural gas network. Banja Luka and Brod are using oil fuel, which for many years was the most expensive source of energy for heating. Then, a large number of district heating systems use coal as the main energy source (Doboj, Tesanj, etc.).

Renewal of existing biomass systems (Sokolac and Pale) has recently been carried out, as well as the transition of some systems (partly or completely) to biomass (Prijedor and Banja Luka). The special group consists of district heating systems that use heat from the power and industrial plants (Zenica, Kakanj, Tuzla and Lukavac). These district heating systems are viable mainly due to the low heat prices they receive from the cogeneration plants. The largest parts of the district heating companies are public companies that finance local communities in which there is a district heating system. This means that these companies are responsible for municipal and city assemblies.

The problem of all DHS is predisposition (the facilities are dimensioned for a much larger number of users than they are now supplying). In addition, the method of calculating heat needs in these systems was based on the fact the system can adequately heat objects at extremely low temperatures. Taking into account that most DHS mainly deliver heat only for heating purposes, the plants work full capacity by only 20% at year level. An additional problem is the low energy efficiency of objects. Taking into account the tariff system (in most of the district heating systems the payment is done per m2 of heated space), the low energy efficiency of the facilities has a very negative impact on the sustainability of the district heating system. District heating in most BiH systems is in poor condition. In addition to high heat losses, the problem is water leakage losses due to leakage.

Skoro svi sistemi daljinskog grijanja s ciljem povećanja korištenja raspoloživih kapaciteta vrše širenje mreže daljinskog grijanja. Aktuelan je i trend prelaska sa uglja na biomasu i to zbog trenda porasta cijena uglja za daljinska grijanja, a s druge strane dolazi i do postepenog razvoja tržišta biomase, čiji su troškovi niži od uglja. Osnovna barijera za razvoj projekata daljinskog grijanja je stara infrastruktura ili potpuno odsustvo infrastrukture i prestanak rada postrojenja (fabrika) koje su isporučivale toplotu, a koje su bile uglavnom iz drvnoprerađivačkog sektora (kao na primjer u Milićima, Vlasenici, Olovu, Kladnju itd.).

Zbog svega navedenog proizilazi potreba investiranja u sisteme daljinskog grijanja kroz ulaganje u rekonstrukciju, revitalizaciju i modernizaciju postojećih sistema daljinskog grijanja i uspostavljanje novih održivih sistema daljinskog grijanja, ali opštine nemaju mogućnost finansiranja ovakvih projekata zbog nedovoljnih i nerazvijenih kapaciteta za pripremu i implementaciju takvih projekata kao i zbog nemogućnosti zaduženja zaduženja s obzirom na postojeća zaduženja. Preko 80% stambenog fonda koji se toplotnom energijom snabdjeva iz sistema daljinskog grijanja, troškove za energiju plaća paušalno, odnosno po m^2 grijane površine. Privredna društva za isporuku toplotne energije, djeluju po principu proizvodnje i isporuke energije (MWh), te „tarifnog sistema“ naplate KM/m^2. Oko 20 % površine stambenog sektora u BiH na daljinskom grijanju, energiju plaća po utrošku gdje pojedine toplane imaju svoje tarifne stavove. Preduslov za motivisanje krajnjih korisnika za uštedu toplotne energije jeste omogućavanje plaćanja po utrošku, što je jasno i definisanom EU direktivama. *Plaćanje preuzete energije po utrošku ne znači da će se plaćati manje, nego da će se plaćati preuzeta/potrošena količina energija.*

Almost all district heating systems with the aim of increasing the use of available capacities make the expansion of the district heating network. There is also a trend of transition from coal to biomass due to the trend of coal prices for district heating, and on the other hand, there is a gradual development of the biomass market, whose costs are lower than coal. The basic barrier for the development of district heating projects is the old infrastructure or the complete absence of infrastructure and the cessation of the heat supply plants that were mainly from the wood processing industry (such as in Milić, Vlasenica, Olovo, Kladanj, etc.).The demand for heat energy in some transition countries has started to grow again.

Due to all of this, there is a need to invest in district heating systems by investing in the reconstruction, revitalization and modernization of existing district heating systems and the establishment of new sustainable district heating systems, using local energy sources and increasing RES but cities do not have the possibility to finance such projects due to insufficient and underdeveloped capacities for the preparation and implementation of such projects as well as due to the impossibility of debiting with regard to existing operational debts.

Over 80% of the housing stock that is supplied with heat from the district heating system, the energy costs pay flat, or per m2 of heated space. Businesses for the supply of heat energy operate according to the principle of production and supply of energy (MWh), and the tariff system of KM/m2 collection. Approximately 20% of the residential sector in BiH on district heating, energy is paid on the expense where individual heaters have their own tariff attitudes. The precondition for motivating end-users to save energy is to enable payment by payment, which is clearly defined in EU directives. Paying the downloaded energy per expense does not mean that it will be paid less, than the downloaded/consumed amount of energy will be paid.

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