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Local Community as the Pillar of Developinga Sustainable Energy Strategy

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ABSTRACT: *Energy is one of the most important fundamental elements for human development and even survival.Energy can be a significant driver for the health and welfare of residents, and the growth and development of business, as well as energy stability for cities and communities of all sizes.The world is in a period of growing energy insecurity, and municipal and business leaders are focusing attention on improving the energy resiliency of their towns and cities.Worries over escalating carbon emissions are adding urgency and uncertainty for policymakers seeking to mitigate the potential impacts of climate change. These issues highlight the need to develop energy infrastructure at a local level, which maximizes resource efficiency and exploits indigenous opportunities. Such steps enhance the energy security and resilience of local communities and shield them from the negative impacts of rising and volatile global energy markets.The city of Tuzla recognized this issue 10 years ago. District heating has been recognized as key measure for ensuring long-term energy security, due its technological flexibility and the capability of networks to be switched to renewable and local resources.Energy efficiency improvement and optimal management of CHP district heating system of the city of Tuzla have showed the best result in the last three heating season.The difference in heating energy savings with regard to heating season 2012/2013 - 7,848 MWh is result of improving management strategy of district heating system.Total energy savings in season 2014/2015 were 90,533 MWh, difference in heating energy savings with regard to last heating season - 5,401 MWh. The outdoor temperature in season 2014/2015 was lower for 1.24°C. Total electricity savings in the seasons 2011/2012, 2012/2013 and 2013/2014 was 59,750 € - 19.92% concerning base season 2010/2011. The electricity bill for one day in the seasons 2011/2012, 201/2013 and 2013/2014 decreased for 23%. With the last season (2014/2015) electricity bill for one day decreased for 27%. We started with 1,538 €/day and now we have achieved 1,123 €/day.All these results have enabled extension of district heating network (system).City of Tuzla in the last 15 years financed connection 337 objects to district heating system (4000 dwellings) with 257,000 m^2 of heated area. The total amount of connected heated area in the last 15 years is 700,000 m^2 and new 8,747 users. District heating infrastructures have an important role to play in the task of increasing energy efficiency and thus making these scarce resources meet future demands. It already became clear that improving the efficiency of energy production, distribution and consumption is a key method of climate change mitigation.Preparing for such instability also increases economic competitiveness. Cities and communities that take steps to improve their energy security and resilience are more attractive to businesses, which provide employment for residents who will, in return, be attracted by a lower-cost, less polluting, and more secure energy supply.Sustainable development is theonly way to achieve the vitally needed harmony between economicgrowth, social progress and environmental protection.*

Keywords: *Local community, Energy challenges, Sustainable energy, Strategy, Efficiency.*

I. INTRODUCTION

Humanity is facing its greatest challenge ever – to transition society towards sustainability [1]. There are many historical examples of local communities that perished due mismanagement of the ecological and/or social systems that they depended upon. Now it holds strategic opportunities for proactive companies, municipalities and regions. By systematically reducing their contribution to the problem and by early on start instead become part of the solution to the problem, they accelerate the transition, become more attractive in the increasingly sustainability-driven market and as such good examples they also encourage others to be proactive and strategic about sustainability.Cities and communities that take steps to improve their energy security and resilience are more attractive to businesses, which provide employment for residents who will be attracted by a lower-cost, less polluting, and more secure energy supply.

Sustainable development is the only way to achieve the vitally needed harmony between economic growth, social progress and environmental protection. It is increasingly clear that the success or failure of the global and European energy transition will depend on largely on what we do in our cities. Given their significance within the broader energy mix, the question of how to supply sustainable heating and cooling in the urban environment is of fundamental importance. Local authorities must have an essential role to play - City of Tuzla recognized it.By 2030, 60% of the world's population will live in cities; cities will account for 75% global use of energy and 80% of CO2 emissions.It is increasingly clear that the success or failure of the global and European energy transition will depend on largely on what we do in our cities. Given their significance within the broader energy mix, the question of how to supply sustainable heating and cooling in the urban environment is of fundamental importance.

The European Commission released its first-ever strategy to optimize heating and cooling in buildings and industryon February 2016.According to the Commission, the heating and cooling sector accounts for half of the EU's annual energy consumption. A strategy to decarbonize heating and cooling by 2050 would save around €40 billion in gas imports and €4.9 billion in oil imports per year, it said.The findings in the Heat Roadmap Europe 2050 can be summarised into three key messages: increasing competitiveness in Europe, recycling heat losses and expanding renewables, and reducing risks in the European energy supply. District heating infrastructures have an important role to play in the task of increasing energy efficiency and thus making these scarce resources meet future demands. It already became clear that improving the efficiency of energy production, distribution and consumption is a key method of climate change mitigation. Today is more than 6000 district heating systems in Europe, supply over 12% total EU27 heat energy demand. Over 60 million people in Europe have their homes heated by district energy.Tuzla is the third largest city in Bosnia and Herzegovina, located in one of the most important industrial Bosnian regions. The town is 239 m above sea level, and it stretches across an area of approximately 294 km^2. The city's population is approximately 120,000 but the greater municipal area has over 170,000 inhabitants.

Table 1. Climate data for Tuzla*

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	2.7 (36.9)	5.9 (42.6)	10.4 (50.7)	15.1 (59.2)	20.3 (68.5)	23.1 (73.6)	25.5 (77.9)	25.7 (78.3)	22.0 (71.6)	16.5 (61.7)	9.7 (49.5)	3.5 (38.3)	15.03 (59.07)
Average low °C (°F)	−4.4 (24.1)	−2.3 (27.9)	0.7 (33.3)	4.4 (39.9)	8.5 (47.3)	11.4 (52.5)	12.8 (55)	12.6 (54.7)	9.7 (49.5)	5.7 (42.3)	1.6 (34.9)	−2.8 (27)	4.83 (40.7)
Average precipitation mm (inches)	71 (2.8)	67 (2.64)	70 (2.76)	74 (2.91)	82 (3.23)	91 (3.58)	79 (3.11)	71 (2.8)	70 (2.76)	77 (3.03)	94 (3.7)	85 (3.35)	931 (36.67)
Average precipitation days	10	9	10	11	11	11	9	8	8	8	10	11	116

***Source:** World Meteorological Organisation (UN)

Tuzla is the economic, scientific, cultural, educational, health and tourist centre of northeast Bosnia. Tuzla is a city in Bosnia and Herzegovina. It is the seat of the Tuzla Canton and is the economic, scientific, cultural, educational, health and tourist centre of northeast Bosnia. After Sarajevo and Banja Luka, Tuzla is the third largest city in Bosnia and Herzegovina.Preliminary results from the 2013 Census indicate that the municipality has a population of 120,441. Tuzla is an educational centre and is home to two universities. It is also the main industrial machine and one of the leading economic strongholds of Bosnia with a wide and varied industrial sector including an expanding service sector thanks to its salt lake tourism.City of Tuzla has issued the decision in 1981 on begin permanently heat entire city from Power plant ''Tuzla''. For this purpose, City and Power plant ''Tuzla'' decided to prepare two units in power plant for cogeneration and heat production.
Today Tuzla is the biggest producer of electricity and the biggest district heating system (DHS) in Bosnia and Herzegovina and one of the biggest DHS in South-Eastern Europe based on cogeneration.The construction of new buildings and connection of existing building to district heating system of Tuzla in the last 15 years resulted in 8,747 new users and 700,000 m^2 heating area.

II. VISION

The world is in a period of growing energy insecurity, and municipal and business leaders are focusing attention on improving the energy resiliency of their towns and cities. It already became clear that improving the efficiency of energy production, distribution and consumption is a key method of climate change mitigation. Preparing for such instability also increases economic competitiveness.

Our current use of energy is a major part of the sustainability problem [1]. The rapidly develop sustainable energy systems is crucial for the whole society's transition towards sustainability. Increased system efficiency and reduced climate impact are important part of this. District heating (DH) systems have been very important for increased system efficiency end reduced climate impact and can continue to play an important role in society's transition towards sustainability.Sustainable development strategy is in need to improve the energy efficiency, to reduce heating costs and to reduce emissions to the environment. To realize this we have three major energy challenges: realizing the low-carbon future, security through self-reliance and sustainable energy[3].The system goal is to be energy efficient, economically successful and environmentally acceptable. In order to have this it is necessary to make efficient production, distribution and consumption of heating energy. The district heating system needs to be designed and adjusted as energy efficient, with optimal management, satisfied end-users and better environment.

III. STRATEGY

Which steps are necessary to development strategy [2]? These steps include different measures, from technical level to organizing and administrative level. The final goal is sustainable development strategy of local community and optimal management of district heating system. It will enable the optimization of all the system such as manage all systems more efficiently (temperature, pressure, etc.), facilitate existing algorithm of process and more efficient production of electrical and thermal energy to combine sound economic growth with little environmental impact and to customer convenience. One of the most important elements in the implementation of all these measures and activities is in depth knowledge of the entire system in order to implement a concept like this one. This new approach to system management results in energy savings and customer satisfaction.

In order to be able to fulfil its role in future sustainable energy systems, district heating will have to meet the following challenges which can be elaborate in the following:

- Ability to supply low-temperature district heating for space heating and domestic hot water (DHW) to existing buildings, energy-renovated existing buildings and new low-energy buildings
- Ability to distribute heat in networks with low grid losses
- Ability to recycle heat from low-temperature sources and integrate renewable heat sources such as solar and geothermal heat.

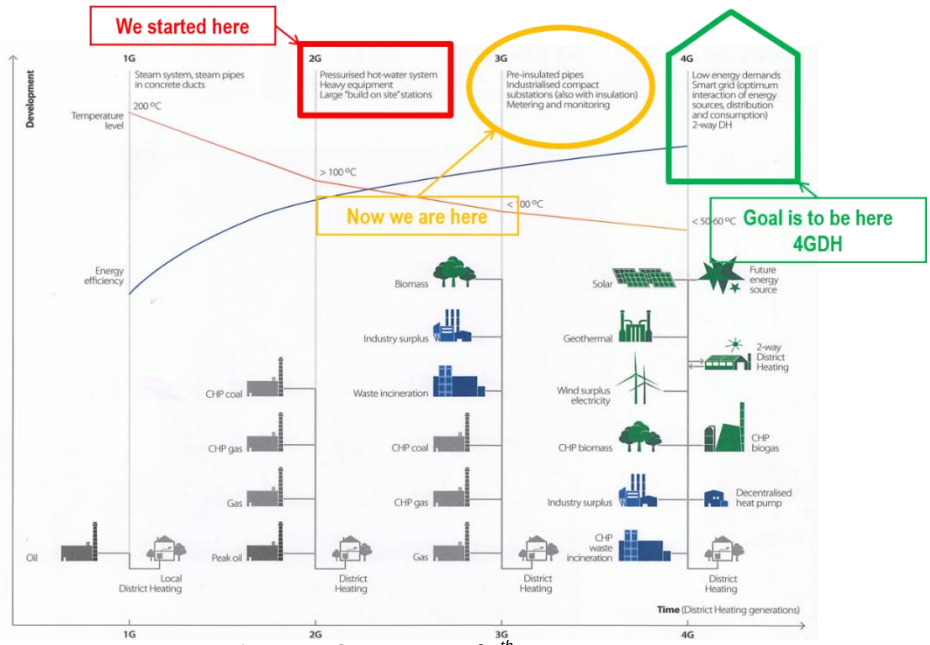


Figure 1.*The concept of 4th generations DHS*

- Ability to be an integrated part of smart energy systems (i.e. integrated smart electricity, gas, fluid and thermal grids) including being an integrated part of 4th Generation District Cooling systems (Figure 1) [3].
- Ability to ensure suitable planning, cost and motivation structures in relation to the operation as well as to strategic investments related to the transformation into future sustainable energy systems (Figure 2) [3].

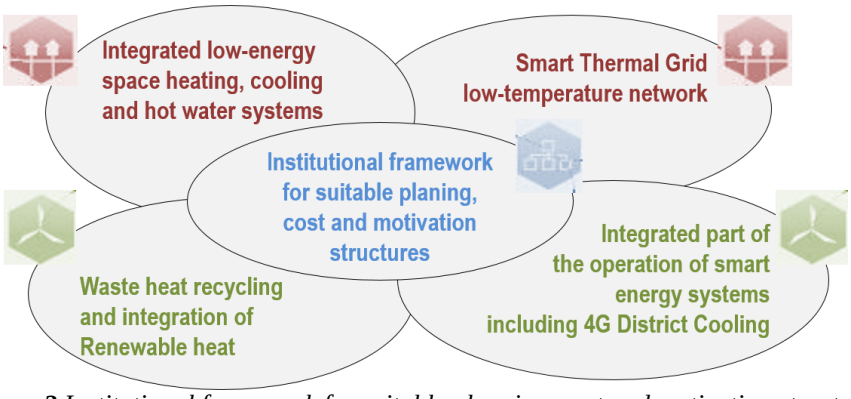


***Figure 2**.Institutional framework for suitable planning, cost and motivation structures*

When we started to develop sustainable development strategy of local community and optimal management of district heating system, we recognized four areas:

- production optimization,
- optimization of heating energy distribution and consumption,
- network and system extending and
- human resource development and marketing.

Some countries, particularly in Scandinavia, show a significant penetration of district heating with over 50% of the heat market. In particular, Denmark has a well-developed district heating infrastructure that delivers heat to 60% of the total heated space. Most of the energy comes from CHP, waste heat and domestic renewable fuels including municipal waste incineration. The Greater Copenhagen district heating system is designed with broad fuel flexibility in mind, providing for a high degree of energy supply reliability.

IV. THE ROLE OF DISTRICT HEATING FOR SUSTAINABLE

Development

In 2010, approximately 12% of the space heating demand in Europe covered by district heating [4]. Many strategies havealready been proposed for the decarbonisation of the EU energy system by the year 2050. These typically focus on the expansion of renewable energy in the electricity sector and subsequently, electrifying both the heat and transport sectors as much as possible. The role of district heating in these strategies has never been fully explored system nor has the benefits of district heating been quantified at the EU level. Heat Roadmap Europe 2050 combines the mapping of local heat demands and local heat supplies across the EU27. Using this local knowledge, new district heating potentials have identified and then, the EU27 energy system has modelled to investigate the impact of district heating. The results indicate that a combination of heat savings, district heating in urban areas, and individual heat pumps in rural areas will enable the EU27 to reach its greenhouse gas emission targets by 2050, but at a cheaper price than a scenario that focuses primarily on the implementation of heat savings [5].

Carbon emissions from energy production have a severe impact on the global climate [6]. The slow transformation of the energy system towards low-carbon alternatives is thus a serious concern. We would like to been recognized as a forerunner in climate change mitigation. This thesis focuses on energy companies with an ambition to contribute to public welfare and the changeover towards a more sustainable energy system.Energy companies must be able to handle social complexity beyond the firm to successful manage transition towards a sustainable energy system. The importance of integrating strategic sustainability thinking into the core business of companies is becoming more and more pronounced around the world.Energy markets are in a process towards liberalization. From a status as local monopolies protected by the government, energy suppliers of electricity, natural gas and district heating are been forced now into a market paradigm, where competition is considered as way to increase efficiency.

V. THE ROLE OF LOCAL COMMUNITY FOR SUSTAINABLE

Development

Roughly, half of the world's population lives in urban areas, and this share is increasing over time, projected to reach 60% by2030. Cities consume a great majority – between 60 to 80% - of energy production worldwide and account for a roughly equivalent share of global CO_2 emissions. Greenhouse gas (GHG) emissions in OECD cities are increasingly driven less by industrial activities and more by the energy services required for lighting, heating and cooling, electronics use, and transport mobility [7].

Most of the measures combating climate change and increasing energy security need to be realised on the local level or cannot efficiently implemented without the involvement of regional actors [8]. Cities account for the biggest share of energy consumed in Europe. At the same time, they offer the biggest potential for system integration and cross-sectorial cooperation. Urban systems comprise not just authorities but also citizens, industries, suppliers and a range of other actors. All together they can create something that is called ‘’a smart city’’.As we all know, ‘’the sustainable energy future’’ is far more than a question of EU regulation and discussions of Heads of State or Government. The sustainable energy future involves all sectors and all actors – it concerns everyone and all fields. Overcoming the still-present silo approach might be the biggest challenge of them all. We would like to do our share bringing together bright minds with different backgrounds, connecting cities, building specialists, consumer representatives, energy companies, policy makers, researchers and many more. Close community engagement will be essential to make plans for the buildings and for heat supply fit together in the long term. It is important that the whole ‘’chain’’ from the source of energy, through the network to the building’s envelope is involved in a coordinated effort that provides optimal solutions. It requires a great effort by all involved.

Fully recognising significance of all the relevant problems, primarily significant air pollution during winter, and higher energy bills for heating and outdoor lightning, the City of Tuzla in 2007 began with series of activities aiming to increase energy efficiency in different spheres. The City established its Energy Efficiency Commission in 2008, while in 2011 it developed and adopted its first Sustainable Energy Action Plan (SEAP).
Baseline data presented in SEAP document shows that 77,27% greenhouse gasses (GHG) emissions comes from building sector, primarily due to the dominant coal-based heating, construction methodology prevailing to date, and status of buildings. In fact, large number of buildings is not completed (with no facade thermal-insulation), and having worn-out air-permeable windows and doors. The City of Tuzla in this planning process also included the existing district heating system that currently provides heat energy to 22,000 urban households and majority of buildings used or owned by public institutions and commerce. This district heating system were established 32 years ago as a co-generation system taking heat-energy from the nearby Power plant ‘’Tuzla’’. However, still a large number (over 30,000) of individual residential houses, mostly those located on the city outskirts remain unconnected to the co-generation district heating and generating heat energy using individual coal-burning stoves, thus heavily polluting environment during 6-month heating seasons.

As one among the first B&H municipalities recognising importance and benefits of energy efficiency increase, the City of Tuzla has so far implemented many efficiency projects. Through various programmes managed by international and national investors, at the same time investing its own budget funds, City of Tuzla to date completed a number of smaller to larger projects in energy efficiency and renewable energy spheres. Primarily they were aimed to increase optimisation and expansion of existing cogeneration district heating system, retrofitting buildings by improving their thermal insulation and installing solar thermal collectors on public buildings whose owners /users need significant hot water quantity. Importantly, the municipal budget for years contains a budget line earmarked for further support to implementation of projects on energy efficiency increase.Long-term vision of Tuzla Municipality in energy efficiency sphere has defined as: Environmental-friendly and energy-efficient Tuzla Power Plant is the only coal-combustion power-generating facility in the Tuzla municipality territory.The main challenge in fulfilling this vision is establishment of self-sustainable mechanism for continuous institutional mechanism enabling continuous managerial &financing support to implementation of energy efficiency measures in both public and private sectors.

1.1. Sustainable energy development strategy

Having in mind status of energy efficiency, scope of pollutant-emissions and degree of air pollution, and the vision of City of Tuzla, the overall project purpose/specific objective of the City of Tuzla is: With the International NAMA Facility, to establish sustainable instrument for managing energy in the City of Tuzla, which by 2040 will result in reduction of CO_2 emission, caused by public and privatesectors heating, from the current annual 500.000 tons to negligible 20.000 tons annually.
The main concept of sustainable energy development strategy based on:

- Fast investment return through energy-consumption savings and/or income generated from renewable energy generation,
- Re-investment of most of the savings and income generated from renewably-energy generation into the newly formed Tuzla Municipality Energy Efficiency Fund;
- Utilisation of the Energy Efficiency Fund for supporting individual households to connect on the existing Tuzla district heating if technically possible, or otherwise to replace their coal-based heating schemes with biomass-based heating;
- Increase of citizens' awareness on their responsibility towards the environmental protection and sustainable use of energy, by applying energy efficiency measures in all spheres of their life.

Taking in account purpose of the Tuzla Municipality' context and its sustainable energy strategy vision, we have developed the overall project idea and identified the following key project components:

- Optimisation of existing district heating system with the aim to improve energy efficiency performance of the system itself, in order to expand its capacity for connecting new heat-energy consumers;
- Connection of individual residential housing units to the district heating system,which includes creation of required technical and financial conditions for new connections of houses located in suburbs of Tuzla, thus enabling these households to stop using coal-based heat energy;
- Replacement of current coal-based heating in individual residential houses with biomass which includes creation of technical and financial conditions enabling individual households in rural parts of Tuzla municipality to start using biomass (pellet) for heating, thus abandoning coal-based heating;
- Expansion of district-heating network by extending it over the Tuzla town hilly outskirts with the aim to create technical conditions for new connection on the district heating of houses located in this area;
- Applying energy efficiency measures on public buildings owned by the Tuzla Municipality in order to generate energy-related and financial savings by reducing energy consumption. These savings will have twofold purpose: first, portion of these savings will be reinvested into the newly created Tuzla Energy Efficiency Fund; and second: energy-savings generated within the district-heating system enabling new connection with the same energy available.
- Improvement of outdoor lightning through replacement of existing lamps: Taking in account size of the lightning network, number and types of currently used bulbs, this measure is viewed as having huge saving potential (both in energy and financial terms) and fast investment return. It has recognised as effective instrument for fast filling-in the municipal energy-efficiency fund. Overall, financial savings projected under this measure would be sufficient for reinvesting part of the savings into the fund, and continuous maintenance of the lightning network and replacement of bulbs after their lifetime expiration.
- Construction and installation of photovoltaic power plants
- This measure is viewed as the measure generating excellent option for filling-in the Energy Efficiency Fund, having in mind high solar-power feed-in tariff. The project includes construction and installation of five solar powerplants with total installed power of 1.66 MW. Along with their income-generation role, installed on roofs of suitable public buildings located in city centre they will also serve important purpose of raising public awareness on win-win solutions placed in solar energy and contribute to overall Tuzla image.
- Establishment of bicycle path
- Since Tuzla lacks cycling tradition, construction of this bicycle path does not brings direct and short-term CO_2 emission-reduction effects. However, it is having extremely important role as awareness-raising and behavioural change mechanism opening large window of opportunity the transport sector is offering in long-term period.
- Establishment of the Tuzla Centre for energy efficiency with involvement of Fraunhofer ISE Institute, and provision of five solar-powered electrical vehicles

The energy efficiencycentre, currently in the final stage of its establishment will during and after this project implementation period implement awareness-raising campaigns and provide technical assistance and consulting services to the citizens, public sector employees, business and other stakeholders, in spheres of energy efficiency and renewable sources of energy. Cooperation with the Fraunhofer Institute will primarily include its technical assistance and knowhow transfer within project components related to solar power, and when it comes to transferring best practices and experiences gained by the City of Freiburg in efficient energy management and green development. Fine solar-powered electrical cars will be used by the staff of Energy efficiency centre and relevant municipal-government departments with the purpose of further promoting energy efficiency among citizens and contribute to building image of Tuzla low-carbon city.

The beneficiariesof the overall project and its specific components are all inhabitants of the Tuzla municipality. The project will significantly improve their life quality, ensuring clean air and healthier environment in general. Specifically, the direct project beneficiaries will be the households supported through the newly established Energy Efficiency Fund to connect to the Tuzla district heating or to replace their coal-based heating schemes with renewables (biomass). At the same time, apart from financial assistance from the Fund, they will also receive technical assistance from the Energy Efficiency and Climate Change Centre. After implementation of these heating-related technical measures, their family budgets will benefit through significant financial savings due to reduced heat-energy costs. In the proposed project the district heating company' role includes implementation of project activities on optimisation of district-heating system and expansion of its distribution network over the town-suburbs, and connecting on the system 2100 individual houses as new heat-energy consumers. The Company is also obliged to regular transfer part of their savings resulting from technical

system-optimisation, into the new energy efficiency fund, as presented in the project financial planning schemes.The City of Tuzla is the main project beneficiary, at the same being ultimately responsible for the project implementation and its co-financing in planned scope and dynamics. The Municipality with its relevant departments is responsible not only for implementation of activities and fulfilment of its objectives in the 5-year project implementation period, but also for their implementation in the period beyond this period and fulfilment by 2040 of long-term project objectives. The Tuzla Municipality' experience in implementation of large-scale projects in energy efficiency sphere, and its highly skilled and experienced team represent strong guarantee for timely and duly fulfilment of all short-term and long-term project objectives. The Municipality is also responsible to performcontinuous monitoring of activity-implementation, both internally and externally by appointing independent external monitors, and regularly report monitoring results to relevant city structures. The Municipality is also obliged to establish municipal energy efficiency fund and adopt rulebooks for its efficient operation; regularly invest planned financial resources into the fund, both from its municipal budgets and savings generated within the project; and ensure effective fulfilment of all Fund's activities and obligations.
What we mean is thatlocal communities should start thinking now about the urban form that will result in the lowest requirements for energy use, while maximizing the opportunities for energy cascading. Compact, mixed-use urban forms will become the norm. This includes the provision for green spaces, green roofs, the distribution and use of grey water and aggressive building energy-use standards. Planning for low-energy buildings today will allow the future use of renewables, such as active solar, for energy supply.

VI. RESULTS

Energy efficiency improvement and optimal management of CHP district heating system of the city of Tuzla have showed the best result in the last three heating season. Total heating energy savings in the last three heating season was 142,473 MWh. Total energy savings in season 2013/2014 were 95,934 MWh. The difference in heating energy savings with regard to heating season 2012/2013 - 7,848 MWh is result of improving management strategy of district heating system.

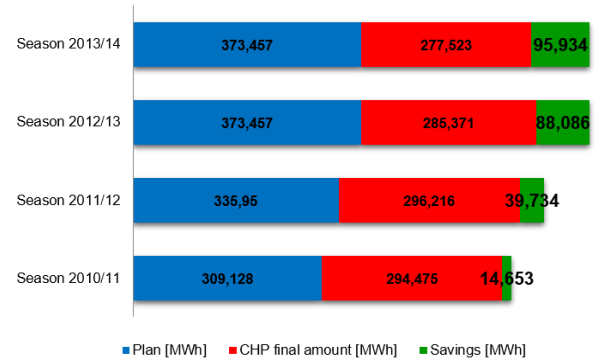
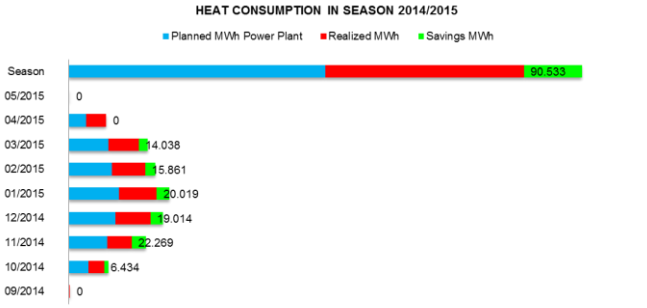


Figure 3.*Heating consumption and savings for seasons 2010/2014*

Total energy savings in season 2014/2015 were 90,533 MWh, difference in heating energy savings with regard to last heating season - 5,401 MWh. The outdoor temperature in season 2014/2015 was lower for 1.24°C. The result of improving management strategy of district heating system has continued.



	09/2014	10/2014	11/2014	12/2014	01/2015	02/2015	03/2015	04/2015	05/2015	Season
Planned MWh Power Plant	0	31.220	60.600	73.860	79.110	68.000	62.160	27.540	0	402.490
Realized MWh	2.037	24.786	38.331	54.846	59.091	52.139	48.122	31.454	1.151	311.957
Savings MWh	0	6.434	22.269	19.014	20.019	15.861	14.038	0	0	90.533

Figure 4.*Heating consumption and savings for season 2014/2015*

The biggest impact on this results had implementation of district heating reengineering – usage of information technology tools, SCADA and Termis and optimization of heating substations. As one of the important result ofimplementation system optimization was reducing the temperature of the water in the network. Designed temperature of the water in the network 145°C we decreased to maximal 121°C. In turn, this reduces heat loss in the network, reducing costs and CO_2 emissions. Total electricity savings in the seasons 2011/2012, 2012/2013 and 2013/2014was59,750 € - 19.92% concerning base season 2010/2011.The electricity bill for one day in the seasons 2011/2012, 201/2013 and 2013/2014 decreased for 23%. With the last season (2014/2015) electricity bill for one day decreased for 27%. We started with 1,538 €/day and now we have achieved 1,123 €/day.

All these results have enabled extension of district heating network (system). In 2011 City council adopted new map of extension district heating network and established new 16 zones. City of Tuzla in the last 15 years financed connection 337 objects to district heating system (4000 dwellings) with 257,000 m^2 of heated area. The total amount of connected heated area in the last 15 years is 700,000 m^2 and new 8,747 users. The new approach to sustainable energy development also resulted in nine renewable energy source projects (kindergarten, health and sport facilities) with total 323 m^2 solar panels and 19,700 l water heaters.

VII. CONCLUSIONS

Sustainable development strategy and optimal management of infrastructure systemsare needed to improve the energy efficiency, to reduce heating costs and to reduce emissions to the environment.Development strategy of Tuzla also means preservation of natural and cultural heritage and human talent as resource of our future development. The final targets of City of Tuzla areall objects connected to district heating system, others connected to micro district heating system or heating by renewable energy, city of renewable energy sources and energy efficiency, reduction of CO_2 and City of Tuzla–''GREEN CITY''. Humanity is facing its greatest challenge ever – to transition society towards sustainability. While climate change mitigation and adaptation policies require significant investment, delaying action can increase future costs and limit future options for adapting to climate change impacts or reducing emissions in cities. Direct costs from climate change impacts can be staggeringly high, especially related to natural disasters and sea level rise [7]. Sustainable development strategy is necessary to improve the energy efficiency, to reduce heating costs and to reduce emissions to the environment. To realize this we have three major energy challenges: realizing the low-carbon future, security through self-reliance and sustainable energy.

Our current use of energy is a major part of the sustainability problem. To rapidly develop sustainable energy systems is crucial for the whole society‘s transition towards sustainability. Increased system efficiency and reduced climate impact are important parts of this. Many communities are striving for energy efficiency and energy self-sufficiency in order to become more sustainable. These efforts result in a reduction of energy use and lower emissions of CO_2 and other gases that further exacerbate the greenhouse effect. Many communities have set ambitious goals for becoming energy and CO_2-neutral. Technology options exist that can be used to achieve these goals. Major opportunities are available through the broader use of an integrated approach to the planning, construction and operation of these systems. With integrated energy systems, the goalis to minimize the required quality of energy input for each end use unless the rejected energy can beefficientlyused elsewhere. It is increasingly clear that the success or failure of the global and European energy transition will depend on largely on what we do in our cities. Given their significance within the broader energy mix, the question of how to supply sustainable heating and cooling in the urban environment is of fundamental importance. Cities and communities that take steps to improve their energy security and resilience are more attractive to businesses, which provide employment for residents who will, in return be attracted by a lower-cost, less polluting, and more secure energy supply.Local authorities must have an essential role to play - City of Tuzla recognized it.Urban government is taking serious action on climate change - even in the absence of national policies - through local regulations, urban services, programme administration, city purchasing and property management and convening of local stakeholders [7].

We can conclude that integration of energy sources with energy users can provide optimum solutions for the reduction of primary energy use, the increased uptake of locally available sources of renewable fuels and residual heat from electricity generation. In particular, it shows that District Energy Systems are an integrative and facilitative technology that allows the connection of multiple users with diverse energy inputs. Most of these energy inputs could be from renewable sources, energy cascaded from a higher-temperatureenergy conversion system or simply waste heat. The application of these integrated systems will result in energy self-sufficiency, increased local employment, a reduction in harmful emissions and vibrant communities.District energy provides a wide range of benefits for communities. These can be broader than simply matters of energy generation, distribution, and supply.The new approach to management and development strategy in Tuzla and commitment to sustainable development strategy and optimal management can be one of the examples for other

cities and local communities in transition states. This approach helps control urban air pollution, improving the quality of life and the vitality of city centres. Communities should start thinking now about the urban form that will result in the lowest requirements for energy use, while maximizing the opportunities for energy cascading.

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