Energy Planning to Sustainable Development

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Abstract: *Only by respecting the postulates and the principles of sustainable development, we can provide an adequate quality of life for all citizens of a community. On the other hand, development of a modern society requires large amounts of energy. It is estimated that 75% of the total consumed energy is spent in complex urban structures. In order to reconcile these two sides, it is necessary to rationally manage the energy and to plan the energy utilization. One way for a local community to provide sustainable future for itself is to develop and adopt urban energy development plans. Benefits coming from the adoption of these strategic documents are: environmental protection, improvement of the quality of life and increased investment opportunities in the community, as well as new employment of local population. The theme of this paper is the situation in the Serbian municipalities in the area of design and development of energy plans. We shall analyze what the legal obligations of local governments are in this area, and then compare the methodology of the Energy Development Strategy of the City of Belgrade with the methodology of the three pilot projects for the cities of Jagodina, Kraljevo and Sombor. These plans were made in the period 2002-2004 within the project called Energy efficiency in the communal energy environment, which was implemented by the Energy Efficiency Agency of the Republic of Serbia, and funded by the European Agency for Reconstruction.*

Keywords: *energy, planning, municipalities*

1. INTRODUCTION

The energy planning has an important place in the EU. European citizens represent only 7% of the total Earth's population, but consume 15% of the total world's energy.

That is one of the reasons why the Climate and Energy Package envisions achievement of following goals by 2020: gas emissions reduced by 20%, energy efficiency improved by 20% and renewable energy consumption increased by 20%, as well as 10% of the total traffic energy consumption in each member state will originate from the renewable energy sources. This 2007 European Council conclusion is followed by National plans which define the methods for accomplishment of these goals. (1) Local governments have a dilemma: should they postpone the goals for preservation of energy and climatic conditions for some better times or should they accept the current crises as a challenge and move towards more efficient use of a smaller quantity of energy, significant increase of renewable energy use and reduction of gas emissions which create the greenhouse

effect. The better quality of life in one city, the higher the creative capacity of its citizens. In the time of crisis, creative thinking, planning and acting are even more crucial for recovery and strengthening. Due to all this, more than 500 cities signed the Mayors' Agreement, in which they voluntarily commit to respect the European Union 3*20% for 2020 goals. (2)

In the transitional countries, such as Serbia and surrounding Balkan countries, the process of planning the energy management development and reaching certain goals relative to the usage of the renewable energy sources, reducing the GHG effect and energy efficiency is only beginning, and involving the local governments into this process is underway. The local government's role in this process is certainly significant, because municipal authorities can influence the energy consumption in the public buildings, public lights, and traffic. We can freely say that the municipalities will have the crucial role in providing adequate conditions and in taking measures for improvement of energy efficiency. (3)

Through the adoption of the Law on energy management ("Official Bulletin of Republic of Serbia", no. 84/2004) in July of 2004, new framework of operations and functioning of the energy sector of Republic of Serbia was established. According to this Law, the Ministry of mining and energy has the authority for carrying out the energy policy through implementation of the Strategy for energy management development, the Program for realization of the strategy and Republic of Serbia Energy Balance Sheet. Based on the Law on energy management, local governments are obligated to adopt energy development 2017 is one of the strategic documents in which the specific goals in the area of energy management have been set for Serbia as the state to accomplish. One of the most important goals for Serbia is to increase, by the end of 2012, the production of power using the renewable sources of energy for 7,4% compared to the level of 2007. (5)

However, depending on human and material capacities of the local governments, these plans and strategic documents will be designed. Some municipalities will first design Strategy for energy management development with a vision and defined directions in which municipality wants to go, while others will skip this step and immediatelly start with creating the Plans for energy management development. These plans are mainly based on the technical aspects of the city energy system, and they are primarily aimed at proposals for possible energy saving. The first method of plan design (when they derive from the Strategy defined goals) is certainly more compehensive and long-term, but it requires more time, money and hiring outside consultants.

This paper presents the methodology of designing the Strategy of energy management development for the City of Belgrade until 2030 (6) and Plans for energy management development – demo project for the cities of Jagodina, Kraljevo and Sombor, which were designed in the period from 2002 - 2004. (7)

2. ENERGY PLANNING IN MUNICIPALITIES IN SERBIA

The Strategy of energy management development is in its nature a basic document which defines the policy of energy resources management and plans the ways to improve the energy management at the city level. In order to implement this strategy, it is necessary to determine the state of energy resources, as well as the level of the energy needs and how they are met, but also the prospects of future needs, having in mind the forseen long-term economic and social

development of the city. Also, Strategy of energy management development should ensure energy usage in environmentally acceptable way in order to achieve economic and social benefits in accordancethe city.

Achieving the sustainable development has become the global imperative, which at the city level also means achieving the economic growth and social welfare without endangering the integrity of tion the environment. This kind of approach to energy is the most significant requirement for accomplishment of sustainable economic development and especially for social growth. Economic growth is usually followed by increase in energy consumption, power supply for example, so it is necessary to provide constant energy supply. On the other side, energy production, transportation and consumption processes are main causes for ever-growing problems of the environmental pollution, starting from the local and regional pollution, all the way to global problems, such is global meltdown initiated by gases causing the greenhouse effect. These are the reasons for defining the energy policy which puts the emphasis on the certainty of supply, but at the same time on the reduction of inevitable harmful effects the energy sector has on the environment. (6)

Prior to starting the design of the Plan for the development of the energy managemet, it is necessary to decide whether tha plan will be designed by the independent consulting firm or the city administration has the capacities to design the plan itself. Experience from Sweden, where such plans have been done since 1970's of the last century, shows that both possibilities are found in practice. Since 1977, Swedish law requires that municipalities develop energy plans which are relative to procurement, distribution and usage of energy. The contents of the plans are mostly different, because the plans were designed in different times and thus based on different measures of national energy policy. The level of municipalities' ambitions is also different, thus some plans include scenario and analysis of environmental impact, while in other municipalities the plans are more of descriptive nature. Common to all plans is that they include current status of the energy system, goals for the energy sector and measures which are foreseen in the future. Those measures are most frequently related to reduction of oil usage, improvement of energy efficiency or greater usage of renewable sources of energy. (7)

Also, it is necessary to decide whether we should first design the Strategy of energy management development as a comprehensive document which will provide guidelines and general recommendations and which will produce specific plans, or we should decide to immediatelly design specific plans which analyze the current consumption and give concrete proposals for energy saving.

In addition, it is necessary to provide that the plan is live document, which produces real results. That can be accomplished by combining the team's technical expertise with the collective desires of the community members.

2.1 Strategy of energy management development for the City of Belgrade

Strategy of energy management development for the City of Belgrade is aimed at long-term planning of the energy management development for the area of the City of Belgrade, and "bottom-up" method. Thus, the total energy consumption is determined, considering the structural changes, as well as development (technological and other) specificities of certain sectors of energy consumption.

Having in mind the existing state of

the energy management in Belgrade, it was concluded that it was not satisfactory in regard to available energy resources (dependance on import of liquid and gas fuels) nor in the regard to the efficiency of their consumption (big losses in energy transformation, transmitting and distribution, as well as in the end energy consumption). Energy sources which Belgrade can count on in the future are also limited (currently Serbia covers approximately 40% of the total energy needs from the import, and in the next 20 years this percentage will increase), so it has been envisioned to lower the import-related energy risks by diversification of fuels and by relying on the local resources. It was also concluded that production and usage of energy in the city leads to the excessive environmental pollution, especially in its central part.

The consumption of the thermal energy, gas and oil products in Belgrade makes up more than one-quarter of the total consumption in Serbia, which covers barely one-tenth of the total needs from the domestic oil and gas sources. In the sector of consumers' goods, the thermal energy usage is especially irrational in the appartment buildings (heat losses are way above the contemporary standards in European Union), while the households still to the great extent use the electric power to heat the space. In addition, energy indicators in industry show that energy consumption per unit of product is several times higher than in the developed countries. Even in the area of Belgrade traffic and transportation, the energy consumption per vehicle and per public transportation user is very high due to the obsolete vehicles, but also due to the inadequate organizational and transport infrastructure.

Based on the previous assessment, global and local, and having in mind the laws that we will have to adopt in the process of joining the European Union, the following goals envisioned in the Strategy emerged: (1) incresing the energy efficiency in the production, conversion, transmitting, distribution and consumption of energy, (2) ensuring sufficient energy for constant supply of the consumers with the diversification of fuels and sources, (3) adequate protection and improvement of the environmental quality, (4) usage of ecologically more suitable energy resources in accordance with the technology development, (5) providing a certain level of independence from the imported energy by encouraging the application of the domestic energy sources (6) creating enabling environment for investments in energy management and (7) supporting the research, development and implementation of new, clean and efficient technologies..

2.2 Demo projects for Jagodina, Kraljevo and Sombor

Plan for energy saving for municipalities Jagodina, Kraljevo and Sombor, has been developed by a consulting firm based on the contract on Energy Planning Demo Project in Serbian Municipalities signed with the Serbian Energy Efficiency Agency (SEEA). Within this contract three municipal energy saving plans were developed for the municipalities of Jagodina, Kraljevo and Sombor. The project team intensively collaborated with the representatives of each municipality and with Municipal teams for energy planning (MTEP), which were established specially for the needs of this project. Municipal teams for energy planning from all three municipalities were very cooperative and collected, or provided, all available information necessary for the project implementation.

Plan of energy management development in a municipality focuses on concrete priorities in that municipality, as defined by the Municipal team for energy planning and municipal policy-makers representing the local government.

These plans analyze in detail the technical and economic performance of energy efficiency improvement possibilities on the side of demand, especially in the housing and tertiary sector (public buildings), assess the technical potential, as well as the viability potential and attainable measures for energy efficiency improvement, and create scenarios of the future energy demand. The potential and costs of energy efficiency improvement are visually shown as the energy efficiency curves on the side of supply.

On the supply side, detailed analysis of the municipal central heating system has been performed and technical possibilities for energy efficiency improvement have been defined, while their cost-effectiveness have been assessed as well.

Also, possibilities for energy efficiency improvement in the utility companies for water supply system and sewer system, and in the street lighting were analyzed, as well as the technical potential and costs of renewable energy usage, while the biomass supply curve was also constructed.

Based on the (energy efficiency) analysis, the Plan for saving energy was formulated. That is the list of concrete tasks and activities which reflects the defined energy priorities in the municipality and it is primarily focused on realization of cost-effective and feasible measures, both on the demand and supply side, including the political and organizational, as well as the technical measures.

Findings for all three cities show that in the housing and tertiary sector, with the central heating systems, significant potential for energy efficiency improvement has been identified and it is 32% for Jagodina, 33 % for Sombor and 35 % for Kraljevo. However, the technical potential itself does not show whether it would be cost-effective to invest in such projects. The viable potential for saving energy, compared to the current prices, is 5% (Jagodina), 14% (Kraljevo) to 17% (Sombor) within the high prices scenario. In the case of abolished subsidies for the prices of energy and heat from the central heating system, viable potential is 20% (Jagodina), which is 21% for Kraljevo of the current heat consumption within the central heating system.

However, current values are very different for the groups of independent apartment buildings and individual buildings, especially in the tertiary sector. What can be a very viable measure of energy efficiency improvement in one case, it would not necessarily have to be viable in another case.

Similarly, there are viable possibilities of energy saving within the water supply sector and street lighting (replacing mercury lamps with the sodium ones). Viable projects allow for commercial ways of funding to be used in their implementation. However, mere savings are not sufficient for funding further expansion of these services and improvement of their quality standards.

When it comes to the central heating, main boilers for central heating have been converted from burning the heavy fuel oil into burning less polluting and less expensive (currently) natural gas in all three cities. Nevertheless, this parity which favors less expensive natural gas is not usual in the standard market economies. In addition, due to the insufficiently developed national infrastructure for gas (seasonal gas storage facility), occasional delays of natural gas supplies from Russia, potential future price increase and growing natural gas distribution availability in these cities, central heating configurations based only on gas heating facilities could be exposed to significant competitive threats in the future. That is why it is of crucial importance that each big investment into central heating system modernization is prepared not only from the technical aspect regarding the reduction of energy losses,

but, prior to actual project realization, detailed analysis of financial feasibility and risk should be done, as well as central heating prices impact assessment. This is especially the case when the project is commercially funded, and not from donations.

More than 12 low-cost viable measures for energy efficiency improvement have been identified, as well as investments in the modernization measures, their economic performance has been analyzed and optimized set of measures has been defined. Key component of the proposed measures is introduction of gauging of the consumed energy – both at the level of the central heating utility company and special gauging of the consumed energy at the level of substation/building.

Results and recommendations for energy planning development in a municipality, based on the techno-economic analysis both on the supply and demand side, have been summarized in the proposed plan for energy saving. The key proposed measures and their basic assumptions have been described in more details.

3. CONCLUSION

The paper presents two planning documents – strategy of energy management development and the plan of energy management development. Both documents are aimed at reviewing the current energy situation in a city, and as their ultimate goal sustainable development and quality of life improvement. Also, the starting point is always current energy situation, then the available energy resources are analyzed, and finally measures for meeting the future energy needs are proposed, but provided that environment is preserved and sustainable development principles are respected. The first approach to creating plans is certainly more comprehensive and long-term, but it requires more time, funds and definitely hiring outside consultants. It is a fact that municipalities, according to the Law on energy management, are obligated to make plans for energy management development ant that is certainly a big shift. Which of these two types of approaches to the creation of planning documents will be the choice of the municipality, depends on its capacity, but also on the budget which is allocated for this purpose.

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