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Address: Trg kralja Aleksandra Ujedinitelja 11, 18000 Niš

Phone: +381 18 528 601 Fax: +381 18 523 268

## ENERGY MANAGEMENT AS A SUSTAINABLE DEVELOPMENT FACTOR OF SERBIA

**Dr Biljana Rakić, Associate Professor\***  
**Stanka Djurić, MA\***

**Abstract:** *Energy policy has a new responsibility to manage the environmental impact of its activities and in the way to support national and international environmental policy. Energy is going to become the dominant factor of business risk. Energy management is needed in order to change a way of getting and distribution of energy. Control of climate changes and their unwanted consequences is imperative in the future of the global energy management. Environmental acceptability is one of the most important criteria in evaluation of applicability for new technologies and investments; current regulations for emission limits in the European countries are very rigorous, with trends to become more rigorous. Those regulations Serbia must apply in the near future. The task of the energy management consists of finding the most compatible instruments which will enable the realization of the wanted goal. The reality, on the contrary, shows the different problems in the realization of these goals. The renewable energy sources and investments into this field are not given appropriate attention in the economic and energy development in Serbia. In this paper we will show evaluation of the energy management state and its influence on sustainable development of Serbia. Energy policy doesn't predict the future; it shows necessary measures in order to realize aims of sustainable energy perspective and illustrates possibilities of system change of energy supply. The basics and the results of the Serbian energy policy in planning and spending area of different energents are also included, as well as the effects of needed rationalization of energy spending.*

**Key words:** *sustainable development, energy management, role of a state, renewable energy sources*

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\* Faculty of Economics Niš; e-mail: [biljana\\_rakic@yahoo.com](mailto:biljana_rakic@yahoo.com)

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### **Introduction**

The global energy crisis of the early 1970s confronted the world with an increasing shortage of energy. Numerous estimates of energy resources and their limited quantities became the center of world public attention, while most of the European countries introduced national energy policy and conservation programs. During the mid-seventies of the last century, average worldwide annual growth rates in energy consumption were about 5.5-6%. Such conditions inevitably provoked the development of a new economic theory and a new energy policy that was expected to offer new solutions for old problems in the light of a general energy shortage, accompanied by constant rise in prices of power sources in the world market. Dependent on the type and consumption of energy sources, predictions are that most of the available reserves of fossil fuels shall be exhausted by the middle of this century. Nowadays, a general attitude prevails that previous level and method of exploiting the resources, as well as their consumption manner, are impossible to sustain. This fact has practically been confirmed by the ecological crisis at local, national and global levels.

Regarding the level of Serbian economic power, predominant line of thought in introducing new energy technologies should be related to their economic justifiability, investment return period, as well as to the changes in electric energy and natural gas prices. The adverse economic situation of Serbia and thereby conditioned non-observance of the energy efficiency increasing program during the last decade of the 20<sup>th</sup> century brought about the following consequences, among others:

- a high consumption of electric energy for heating the residential areas,
- a low energy efficiency in industry, together with obsolete, energy-intensive production technologies,
- energy inefficient systems of central and district heating,
- outdated energy solutions in industry,
- technically worn-out, energy inefficient and "dirty" municipal energy supply services,
- a low degree of using the existing potentials of renewable energy and waste-to-energy sources,
- underdeveloped application of the effects of combined production of electric and thermal power,
- financially untenable business operations of the enterprises for electric power production, transmission and distribution, due to the energy selling prices that do not justify real production costs,

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- insufficiently developed and applicable energy management (energy management in developed countries is practiced as one of the regular measures for enhancing the energy efficiency).

There is an undeniable need for big investments into the energy sector in order to improve and modernize the energy infrastructure, as well as a need for developing and implementing a comprehensive policy of promoting energy efficiency and exploiting renewable energy sources, but the improvement potential is also big. The reform of Serbian energy sector represents de facto an establishment of a new energy policy, in the sense of defining aims and priorities under the Strategy of Energy Sector Development and determining the role of governmental bodies and energy entities within the framework of a new institutional organization of energy-related activities in Serbia. The changes have to conform both to the economic development of Serbia and to the EU energy practices and the standards set up for EU candidate countries.

### **1. The imperative for a new energy management in Serbia**

A definition of new energy management is the basis of Serbian energy sector reform, in the sense of defining the targets and priorities under the Strategy of Energy Sector Development and determining the role of governmental bodies and energy subjects within the new institutional organization of energy-related activities in Serbia. Thus conceived national energy policy enables the entities of the power supply industry to realize the priorities within their plans and strategies of the development of relevant energy sectors, including the certainty of conditions for private and foreign investments into new energy-producing facilities in Serbia.

The new energy policy basis implies the estimated growth of energy needs and electric power production, together with the increased participation of domestic resources. All the sectors of final energy consumption, like industry, civil engineering and traffic, exhibit an obvious years-long underdevelopment regarding the energy efficiency. This falling behind is evident in relation both to the developed EU countries and to our immediate surroundings.

Taking into consideration that energy in Serbia still represents an instrument of the social policy, the employment policy and the policy of attracting foreign investment, the parity prices of energy resources and services are not realistic. The facts that Serbia earmarks over billion dollars per year only for the import of high-quality energy sources (oil, gas, coke,

electric power) and that almost the same amount goes to the costs of final energy production from domestic energy resources indicate the need of urgent intervention, starting from regulations to technical measures which would provide a decrease of evidently high energy losses both in the power-source production and distribution systems and in the energy consumption sectors.

High losses and irrational consumption of energy, as well as an increasing dependence on import, represent a serious and sufficient reason for Serbia to include the increase of energy efficiency and the usage of local, particularly renewable energy sources into its development priorities.

The essential aims of the new energy policy of Serbia are:

- A reliable domestic production and an unfailing supply of power from the existing energy sources with improved technological and technical operational characteristics,
- A harmonization of the entire energy system operation and development with the consumption sector needs for energy and with the development of relevant sectors of economy,
- Efficient production and rational economic-effective and energy-efficient exploitation of energy sources aimed at influencing volume and structure of the consumption of high-quality power sources and efficient protection of the living environment,
- An introduction of new legislative and institutional settings for the business operations of energy companies and other energy-related entities,
- Gradual structural economic changes in energy companies, adequate for market-oriented activities in the domestic and regional energy markets.

Notwithstanding a positive orientation toward the improvement of the conditions in the area of renewable energy sources and power-source efficiency, significant obstacles still persist in the implementation of measures aimed at the energy consumption reduction and at the increased usage of renewable sources. Major obstacles may be classified in the following manner:

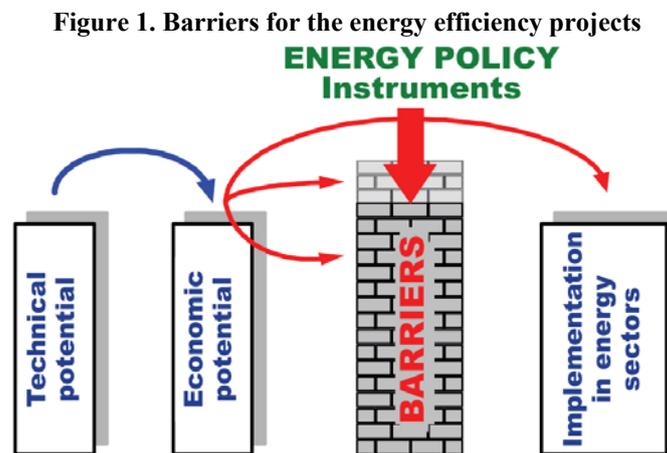
- lack of information and distrust of various possible users related to available technologies and potential financial gains;
- inadequate institutional and legal framework for launching and supporting projects in the field of renewable energy sources, energy efficiency and environmental protection;

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- high direct investment costs and limited financial capacities of end-users for investing;
- lack of local users' experience in developing cost-effective projects;
- shortage of information and experience about the operation of new financial mechanisms, like the ESCO (Energy Saving Service Company)<sup>1</sup> mechanism, for launching projects of renewable energy sources and energy efficiency;
- deficient experience and information about the constructed and tested plants;
- insufficiently developed or nonexistent market of services and energy products equipment in the sphere of energy efficiency and renewable energy sources;
- lack of experience and absence of institutions that provide funds for such projects;
- non-availability of systematic governmental incentive (funds for renewable energy sources and energy efficiency, preferential import taxation, etc.).

Numerous empirical studies have indicated the existence of substantial technical and economical potentials in the sphere of increasing energy efficiency and renewable energy sources but, nevertheless, many obstacles in their application require undeferrable implementation of energy policy instruments (Figure 1.).



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<sup>1</sup> The companies offering their clients reductions in energy costs through investing their own money and being paid back by the achieved savings. There are several performance contract modalities. These companies are specialized in power and water supply areas.

In consequence of the existence of these and other obstacles, the local market of services and products related to energy efficiency and renewable energy sources is underdeveloped. Interventions are also necessary in both the aspects of demand (information and motivation of users in the application of economically justifiable measures of energy efficiency and renewable energy source technologies) and of supply (provision of production and service capacities). The EU countries are far ahead of us in exploiting renewable energy sources, which are estimated to have the potential of providing about 30% of electric power production up to 2020. For example, wind energy already provides ca 20% of the total gross electricity production in Denmark, 8% in Spain and 6% in Germany.<sup>2</sup>

Considering the fact that Serbia lacks energy sources, as well as regarding the global trends in power supply development and preservation of environmental potentials, it is our opinion that the following directions of energy supply in Serbia are optimal:

1. Increased energy efficiency;
2. Enlarged share of renewable energy sources;
3. Use of waste for energy production, reduction of environmental pollution and raw material provision;
4. Tightening up the requirements for the environmental pollution reduction, in particular the decrease in emissions of CO<sub>2</sub>, as well as introducing stricter marginal emissions;
5. Energy market deregulation followed by emphasizing a distributed energy production;
6. Stimulating mechanisms for a promotion of investment into the energy sector.

The stated energy potential is undoubtedly significant and it stands at about 10-15% of the present final energy consumption in Serbia. The exhibited necessary investments do not have additive structures, but they should be selectively analyzed upon determining top-priority lines of activities.

Since a principle is proclaimed to develop Serbian economy as a knowledge-based economy, and inasmuch as scientific and professional institutions should considerably contribute to the new energy policy creation and implementation, their development would have to focus on:

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<sup>2</sup> "An Energy Policy for Europe" (2007), European Commission, Brussels

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1. Their strengthening and restructuring with the aim to attain higher levels of applied research and to increase their self-sufficiency, preserving at the same time their scientific identity;
2. The improvement of service users' capabilities to develop, employ, adjust and commercialize technologies.

**SWOT ANALYSIS**

<p align="center"><b><u>STRENGTHS</u></b></p> <p>Good potential of renewable energy sources (biomass, geothermal sources...)</p> <p>Comparatively well developed gas and electricity distribution network</p> <p>Solid technical human potential</p> <p>Relatively good economic activities of industries</p> <p>Gradual liberalization of the electric energy market</p> <p>Formation of reliable tariff regulation systems for renewable energy sources</p> <p>Development of energy equipment production capacities</p>	<p align="center"><b><u>WEAKNESSES</u></b></p> <p>Absence of energy development strategy in Vojvodina (energy savings through energy efficiency and participation of renewable energy sources in energy supply)</p> <p>Slow demonopolization of electric power production and trade</p> <p>Inadequate level of financial independence in organizing and realizing development programs</p> <p>Unrealistic energy parity prices</p> <p>Slow pace in enacting necessary laws and decrees</p> <p>Lack of penal regulations</p> <p>Non-disposal of property</p> <p>Nonexistence of fiscal rebates</p> <p>Nonexistence of subsidized energy prices for renewable energy sources and modern energy efficiency technologies</p> <p>Low interest for the studies of power systems and related technical fields</p>
<p align="center"><b><u>OPPORTUNITIES</u></b></p> <p>Assembling and mobilizing qualified personnel</p> <p>Creation of a market of knowledge and of new technologies production and services</p> <p>Enactment of adequate laws and regulations that would enable energy sector development</p> <p>Formation of a fund of energy efficiency and renewable energy sources in Serbia</p> <p>Increase of the level of information and improvement of education</p>	<p align="center"><b><u>THREATS</u></b></p> <p>Bureaucracy</p> <p>Resistance to changes</p> <p>Political instability and consequential slowness in realizing proclaimed reforms</p> <p>Brain drain of scarce professionals in power supply</p> <p>Reactions of local population</p>

An enlarged and strengthened technological basis and developed links between scientific research institutions and industry shall help enterprises to enter the global market more efficiently. Thus formulated aims clearly indicate the need for a reorientation of particular faculties and institutes to applied science and direct communication with potential clients. The restructuring of the significance and role of scientific research institutes implies:

- Building up the management structure and the structure of strategic planning and management, as well as introducing the management of changes;
- Improvement of operational and financial structures by implementing a modern information management system;
- Human resource development: improvement of the human resource policy, upturn of the system of reward/promotion, personnel structure alteration, staff training;
- Upgrading of physical infrastructure (laboratory equipment and facilities);
- Strengthening of business development and marketing, management of contracts and intellectual property, introduction of transparent criteria for launching and supporting research programs and individual projects, establishment of scientific technology parks and, where feasible, profit centers.

Moreover, it is necessary to establish mechanisms of monitoring the reorientation process of scientific educational institutions in order to achieve optimal common results.

## **2. Economic instruments of energy management**

In the Freedom House report<sup>3</sup>, Serbia is characterized as "one of the biggest consumers and polluters in the Western Balkans". This conclusion is based on the following facts:

- Energy intensity is extremely high - the ratio of total primary energy supply per unit of GDP is 5 times more than the world average and 8 times more than the average in the OECD.
- The intensity of carbon emission is 6.6 times more than the world average and almost 11 times more than the OECD average.

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<sup>3</sup> "Energy in South East Europe: A Legal Snapshot of Serbia and Kosovo" (2007), Freedom House

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- Electric energy consumption is inefficient in terms of value creation.
- Energy inefficiency is clustered in the most densely populated areas.
- Serbia is spending increasing amounts of high-quality energy (electric energy, petroleum products) for disproportionately small gains in GDP.

A successful accomplishment of the task of attracting foreign direct investments to increase and implement investing into renewable energy sources requires a synchronization of the operation of several institutions in order to complete the following activities: determination of programs and measures for the promotion of investment into the region; preparation of a presentation of opportunities and advantages for foreign investors; alleviation of administrative procedures for new investments; ensuring assistance to investors in making connections with relevant institutions; provision of information, advice and prompt administrative services; rendering help in establishing necessary infrastructure; adopting a long-term policy of using, buying and selling land for commercial purposes, with no discrimination and restrictions related to foreign investors. All these activities, together with special promotion of available human resources, should be synchronized on both local and regional levels, including the institutions in the domain of local government, business associations and employment agencies.

EU legislation in the sphere of energy efficiency and usage of renewable sources is very dynamic, enacting new laws, adopting strategies and guidelines and monitoring the enforcement of the existing regulations. The European Commission adopted (in 1996) the Green Paper on energy efficiency, which identified the need for introducing specific measures to improve energy efficiency at all levels - national, regional and local. Specific directives subsequently emerged from this document. European Union energy consumption grows steadily year by year, thus increasing the consumption of fossil fuels. At the same time, the electric energy demand in the EU grows at the rate of 1.5% per year.<sup>4</sup>

Serbia is lagging substantially far behind in this area and its attempts to approach Europe often remain only declarative. This situation is additionally aggravated by the fact that the data on energy sector are actually considered "top secret" and remain unpublished for years, although they should be available to the public. In compliance with the EU standards, guidelines and "The Green Paper on Energy Efficiency", it is possible to

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<sup>4</sup> "An Energy Policy for Europe" (2007), European Commission, Brussels

define modes of clean energy use and form strategic plans for the implementation of such programs in Serbia. Electric energy consumption grows progressively, while the energy deficit is very pronounced in the Balkan area. Only Bulgaria of all the Balkan countries used to have a favorable energy balance and to fully satisfy its own needs, until the closure of its nuclear plants. Serbian electric power industry cannot pride itself on a single newly constructed production plant in the last fifteen years.

The results like these are surely disturbing and it is very difficult to predict how to achieve balance between the galloping consumption and the stagnating production. In recent years, due to droughts, hydro-power plants have not been capable of producing 15% of the total energy supply, which is not sufficient, notwithstanding excellent work of thermo-electric power plants. Therefore, great quantities of electric power have had to be compensated through imports. The disastrous pricing policy (designed to preserve social peace) has in the last decades produced long-term consequences the effects of which are yet to be felt.

It should also be mentioned that from 1990 to 2005 the consumption in Serbia increased by 5.86 billion kWh and that not a single electric power plant was built in that period. At the same time, it is most certain that the existing power plants shall never reach previous records in electric power production, so it may be concluded that Serbia might face electricity supply problems in the near future. The pricing policy is also highly questionable. Large quantities of electric power are imported at considerably higher prices, causing a significant outflow of foreign currency that could have otherwise been invested into new production capacities. Moreover, a very small number of bidders in tenders released by the Electric Power Industry of Serbia show capability to fully supply the required quantity of electric power. This is an indication that the energy crisis has spread to the entire region. An additionally aggravating circumstance is that it is very difficult to find energy in winter, when Serbia needs it the most. For these reasons, the Electric Power Industry of Serbia should rely more on its own electric power plants. After the standstill of 15 years, it is imperative to construct new plants that would provide additional 800 MW, by which electric energy import would be avoided.

A solution is seen in the creation of the South East Europe Regional Energy Market, through contractual energy exchanges and joint investments into building new capacities and finishing the facilities in construction. According to the World Bank studies, the Balkan region shall be lacking 15500 MW of electric power by 2020, but if this problem is jointly approached, the demand could be satisfied with 11000 MW, by which

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considerable financial means would be saved. The Balkan Network development shall have a tremendous significance in minimizing the number of "bottlenecks" in the future regional electricity market. The "bottlenecks", i.e. shortages of transmission capacities between the producers and consumers shall represent the biggest problem upon opening the electricity market. Consequently, we have to prepare the transmission system for new requirements that it shall have to meet, because it was made and optimized for the conditions of a regulated market in which power flow changes are relatively small through the year. As soon as the number of "bottlenecks" gets minimized, economic reasons shall tilt the balance in favor of deregulation. The future electricity market shall have no technical restrictions in fulfilling economic demands and it will be ready to operate with the least possible expenses. Only then we may expect full advantages of a free market.

The significance of the regional integration in the Balkans is maybe greater than in other parts of the world. On the one hand, there is a fairly large number of relatively poorly interconnected small systems, while on the other, these systems were developed (especially in the ex-Yugoslav countries) as parts of a larger system. Beside that, electric energy production shows a surplus in some countries and a deficit in the others. The Balkan system as a whole would show a mild surplus. Although most of the Balkan countries are now integrated into the 2<sup>nd</sup> UCTE Zone, this is not sufficient. It means that, even with the existing transmission system, a bigger system in its entirety would be more stable as compared to isolated systems of individual Balkan countries. Alongside with the regional integration, a higher-level integration with other European, and especially EU-member countries should be insisted upon.

### **Conclusion**

Pursuant to the universally accepted sustainable development principle, energy policy has a novel responsibility to manage the impact of human activities on the living environment and thus support national and global ecological policies. Ecological acceptability has become an obligatory criterion in evaluating the implementation of all energy technologies worldwide. Strict regulations to reduce harmful gas emissions, tending to become even stricter, shall inevitably have to be applied in our country as well. However, the practice has pointed out different problems in the realization of these goals, since the investment into renewable energy sources has not yet assumed a significant place in the power-supply and industrial development of Serbia.

Growing needs for energy, as well as ever greater problems related to the environmental protection, impose economically and ecologically efficient energy production. As large power plants are less agreeable solutions from the aspect of environmental protection, the development of smaller, independent power plants located in the energy consumption areas has been promoted. Degrees of utilization for the energy production technologies and the "ecological quality" of electric power are essential energy management factors. Most of the European countries have introduced national programs of energy policy and conservation, while new technologies using less energy per production unit are being developed and implemented parallel with that. Numerous research institutions and teams dealing with new technologies, renewable energy sources and environmental protection have been formed. Sweden, for example, has more than 185000 geothermal heating and cooling stations by today, while bioethanol already accounts for 4% of fuel in the petrol market.

Serbian economy is also burdened with an irrational energy consumption, which can be illustrated by unfavorable indicators of energy consumption per unit of GDP, by the share of energy costs in the gross domestic product, both total and by sectors, and particularly by industry groups. From the beginning of the 1990s until now, the mentioned energy consumption indicators have deteriorated so much that all analyses suggest that the planned economical recovery of Serbia by 2012 may be accomplished only under the condition that the energy consumption indicators be brought to the level of 1990 at least. This way, the economic effectiveness of consumed energy and the energy efficiency of power use would be leveled with those of central and east European countries that achieved rapid economic development in the previous decade.

High losses and irrational consumption of energy, as well as the growing dependency on imports, represent a serious reason for Serbia to include the increase of energy efficiency and the use of local, especially renewable energy sources. Direct instigation of thus oriented activities in the energy consumption sectors requires the formation of a designated fund for energy efficiency, the issuance of the National Program for Rational Energy Use, as well as the adoption of a special Law on the Rational Use of Energy, which should provide a legal framework for the realization of mentioned activities. All the planning documents of the Republic of Serbia (the Energy Law, the Strategy of Energy Development up to 2015, the National Economic Development Strategy), together with the activities of competent institutions and programs they are carrying out, identify the previous statements as priorities, that is, as preconditions for catching up with European standards in the sphere of energy efficiency and use of renewable

energy sources. In addition, a public promotion should be worked on related to the significance of this problem not only for the economic development of Serbia but also for the environment protection and the population life quality improvement, since the impression is that public benefits of the energy sector reform have not been sufficiently comprehended.

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## **ENERGETSKI MENADŽMENT KAO FAKTOR ODRŽIVOG RAZVOJA SRBIJE**

**Rezime:** U uslovima visokih stopa rasta potrošnje energije na globalnom nivou, došlo je do razvoja nove ekonomske teorije i politike i novog energetskog menadžmenta od kojih se zahteva da za stare probleme ponude nova rešenja u svetlu opšte nestašice energije, praćene kontinuiranim poskupljenjem energenata na svetskom tržištu. Prema uputstvima Kjoto protokola, radi smanjenja emisije gasova staklene bašte neophodno je smanjenje upotrebe neobnovljivih energenata za 8%. Programi i akcioni planovi kojima se obezbedjuje povećanje energetske efikasnosti postali su važan deo mnogobrojnih dokumenata, politika, strategija i mera za usaglašavanje sa Kjoto protokolom i pojavljuju se u svim relevantnim dokumentima kao deo daljih obaveza. Primenom principa energetske efikasnosti smanjuje se upotreba konvencionalnih izvora energije koji, osim što su ograničeni, predstavljaju i najznačajnije incidentne elemente u prirodnoj ravnoteži. S obzirom na stepen ekonomske snage Srbije, dominantna razmišljenja pri uvođenju novih energetskih tehnologija bi trebalo da imaju u vidu njihovu ekonomsku opravdanost, vreme povraćaja investicija, kao i promene cena električne energije i prirodnog gasa. Primena gotovo potpuno zanemarenih obnovljivih izvora energije, čiji potencijali postoje u Srbiji ali nisu dovoljno ispitani i tehnološki usavršeni, takodje se nudi kao jedno od rešenja koje treba da dovede do očuvanja preostalih resursa, očuvanja životne sredine i održivog razvoja energetike. Veliki gubici i neracionalna potrošnja energije, kao i rastuća uvozna zavisnost su dovoljni razlozi da Srbija u svoje razvojne prioritete svrsta povećanje energetske efikasnosti i primenu lokalnih, posebno obnovljivih izvora energije.

**Ključne reči:** održivi razvoj, energetski menadžment, uloga države, obnovljivi izvori energije